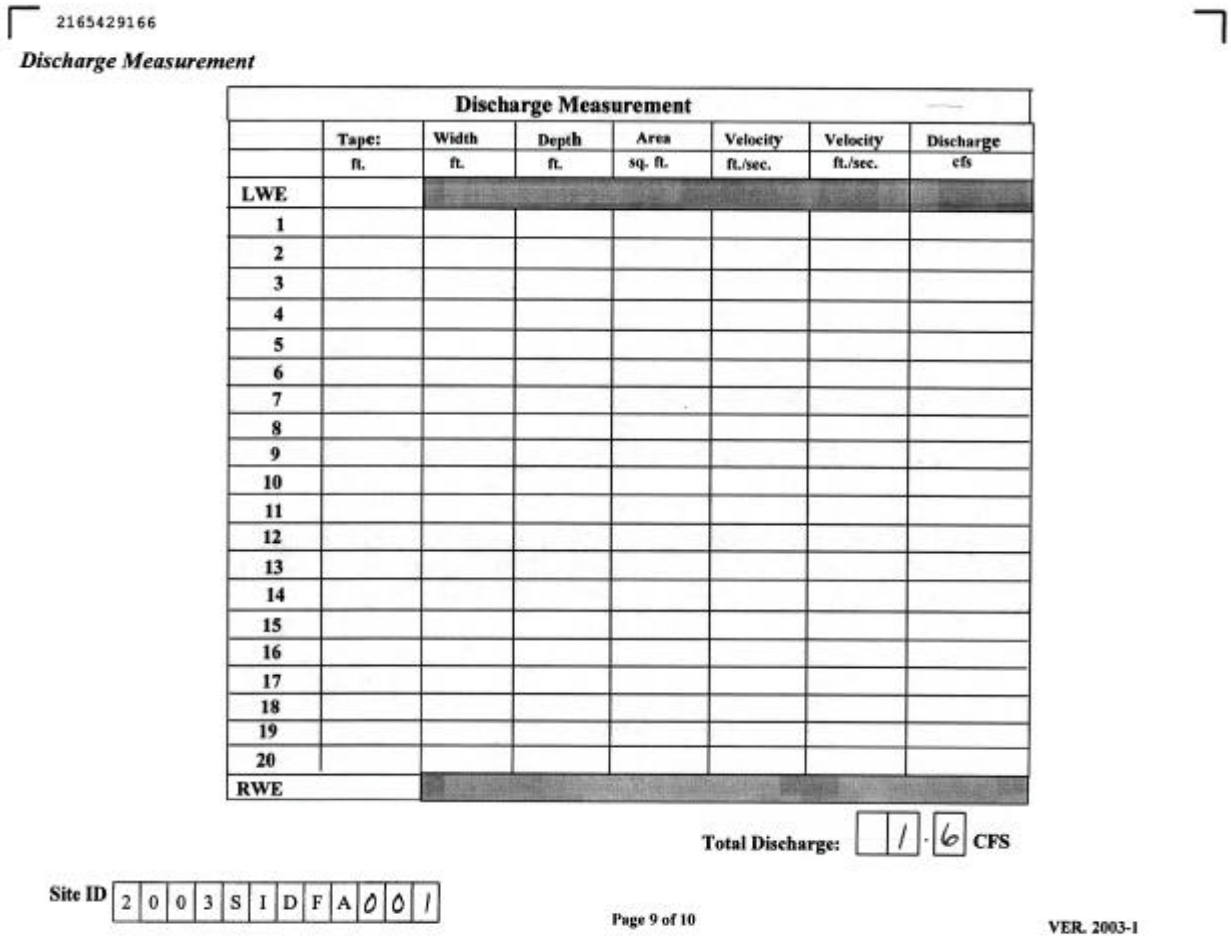
3.3.12 Discharge Measurement Page



2165429166

Discharge Measurement

Discharge Measurement

	Tape: ft.	Width ft.	Depth ft.	Area sq. ft.	Velocity ft./sec.	Velocity ft./sec.	Discharge cfs
LWE							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
RWE							

Total Discharge: 1.6 CFS

Site ID 2003SIDFA001

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Figure 30. Discharge Measurement page example.

Discharge is the volume of water passing a given point per unit of time (Armantrout 1998). Davis et al. (2001) note that "discharge, at summer base flow, is a measure of minimum stream size and an indicator of potential habitat for fish and aquatic invertebrates." Nelson et al. (1992) found flow to be one of the physical attributes that distinguished streams from different geologic regions. Flow patterns affect habitat characteristics such as erosion (in part), distribution of aquatic assemblages, and movement of suspended materials (Rankin 1995). Other associated variables such as discharge and gradient may provide useful forms of stratification (Rankin 1995).

If using a pressure-sensitive electromagnetic flow meter (e.g., Marsh-McBirney Flowmate 2000), use the time-averaging function and set it for 10 second intervals. Record negative (-) readings of a pressure sensitive electromagnetic flow meter as 0. Locate a straight non-braided stretch of the sampling reach. Place a measuring tape across the stream perpendicular to the flow. Take evenly spaced velocity measurements (a minimum of 0.5 feet per measurement in the center of

the cell; see Figure 31) with 20 measurements from wetted bank to wetted bank so that no more than 5% of the total discharge is in each partial cross-section or cell (Harrelson et al. 1994). Record the horizontal distance measured from the tape. Record depth and velocity from the top-setting wading rod and electromagnetic velocity meter. If the stream is narrow with homogenous depth and substrate, more than 10% of the total discharge may be in any partial cross-section or cell. For depths less than 2.5 feet, take one velocity measurement at 60% of the depth. For depths greater than 2.5 feet, take two velocity measurements for each partial cross-section; one at 20% of the total depth and a second at 80% of the total depth. You may measure flow outside the reach if no suitable area is available within the reach; however, it should be taken no more than one reach length outside the survey reach and only where no other obvious inflow is taking place between the reach and the point chosen for measuring flow.
Total Discharge is a decimal justified field.
The entire stream width must be waded, so be particularly aware of personal safety while conducting flow measurements. If wearing waders, be sure the soles have adequate traction. If the stream cannot be safely waded, the river protocol should be used.

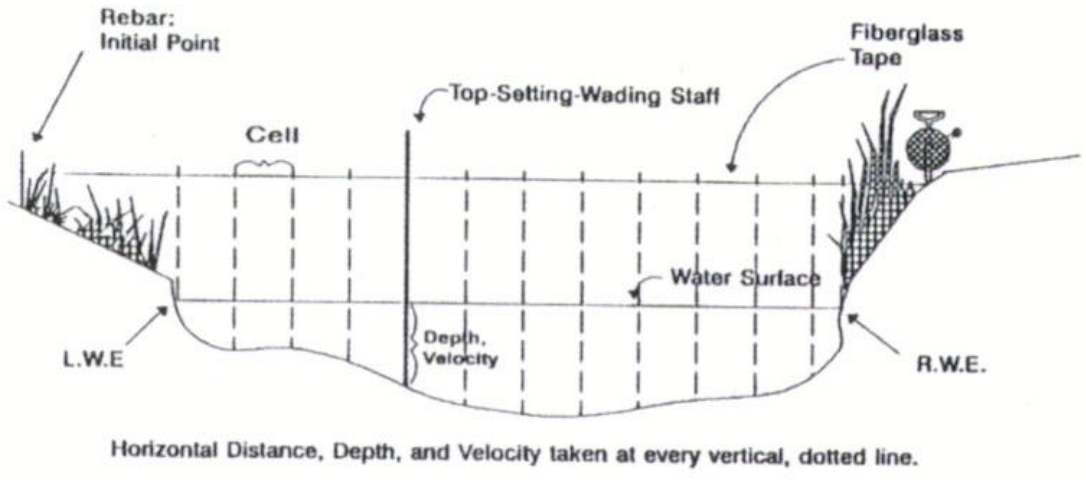
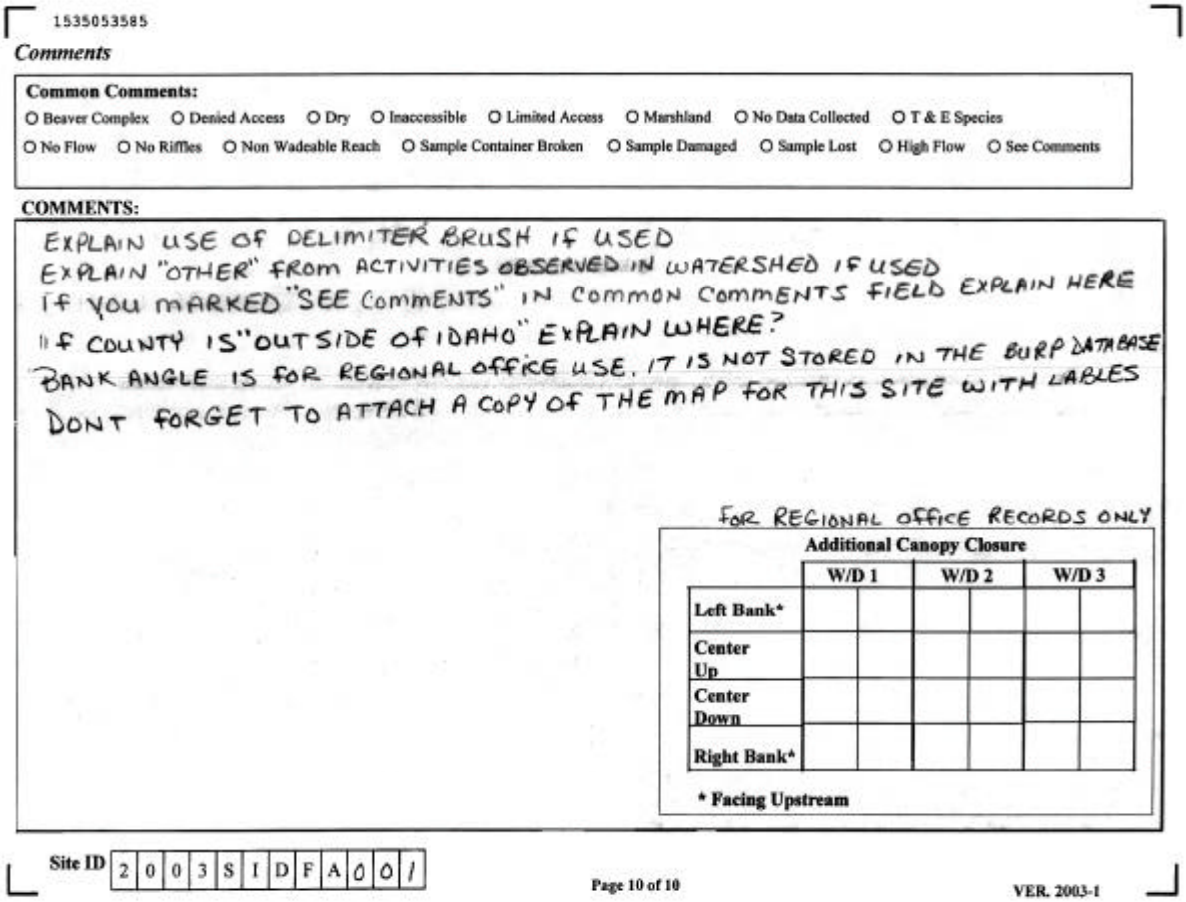


Figure 31. Illustration of Discharge Measurement Locations.

3.3.13 Comments Page



1535053585

Comments

Common Comments:

O Beaver Complex O Denied Access O Dry O Inaccessible O Limited Access O Marshland O No Data Collected O T & E Species
O No Flow O No Riffles O Non Wadeable Reach O Sample Container Broken O Sample Damaged O Sample Lost O High Flow O See Comments

COMMENTS:

EXPLAIN USE OF DELIMITER BRUSH IF USED
EXPLAIN "OTHER" FROM ACTIVITIES OBSERVED IN WATERSHED IF USED
IF YOU MARKED "SEE COMMENTS" IN COMMON COMMENTS FIELD EXPLAIN HERE
IF COUNTY IS "OUTSIDE OF IDAHO" EXPLAIN WHERE?
BANK ANGLE IS FOR REGIONAL OFFICE USE. IT IS NOT STORED IN THE BURP DATABASE
DONT FORGET TO ATTACH A COPY OF THE MAP FOR THIS SITE WITH LABLES

FOR REGIONAL OFFICE RECORDS ONLY

Additional Canopy Closure

	W/D 1		W/D 2		W/D 3	
Left Bank*						
Center Up						
Center Down						
Right Bank*						

* Facing Upstream

Site ID 2 0 0 3 S I D F A 0 0 1

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Figure 32. Comments page example.

There are two sections on the Comments page. In the first section (Common Comments), select conditions or events they appear or occur in the reach. Write down any additional comments in the second section.

3.3.13.1 Common Comments

Fill in the circle for any of these conditions that exist or events that occur. This is a multiple selection field; choose all that apply.

3.3.13.2 Comments

Record any valuable information that is not called for elsewhere in the field forms such as observations concerning vegetation, geomorphology, impacts due to humans or natural events, riparian zone, fish, amphibians, etc. Also provide any needed explanations, such as information about collecting specimens (modification to protocol to collect samples) or factors affecting reliable data collection (high flow, low flow, etc.).
These comments are not "read" or stored directly by the database program; they are entered (typed in) separately by a data entry person. Please print legibly. The forms are kept on file for later reference.

3.3.13.3 Additional Canopy Closure

Fill in the Additional Canopy Closure section. This information is for regional office use only. It is not read or stored by the database program

3.3.14 Fish Data Sheets

3.3.14.1 Importance of Fish Data

Fish contribute significantly to the ecology of the aquatic community. This biological assemblage is highly visible to the public and is an important economic resource in Idaho. Additionally, fish have relatively long life spans which can reflect long term and current water quality conditions. Due to their mobility, fish also have extensive ranges and may be useful for evaluating regional and large habitat differences (Simon and Lyons 1995).

Each BURP site should have accompanying fish data that are less than five years old. BURP coordinators should look for other agency, index-compliant data, particularly if there are endangered species present that are not permitted for "take." It is recommended that the site be electrofished because comprehensive data with all species (game and non-game) and length is often not available elsewhere.

3.3.14.2 Permits for Taking Fish

Before performing any electrofishing, DEQ obtains all necessary permits. A Scientific Research and Take authorization must be obtained from the National Marine Fisheries Service in regions where steelhead and salmon occur. The permit is for researchers whose studies may capture, harass, or harm any species of fish. DEQ submits one statewide application directly with the National Marine Fisheries Service as 4(d) Scientific Research and Take Authorization. DEQ prepares a comprehensive report to meet steelhead permit reporting requirements.

Each DEQ regional office is responsible for coordinating and obtaining a Scientific Collection Permit from the IDFG. Each office adheres to the stipulations and provisions of the permit, particularly concerning waters containing endangered species. Often, permits include a stipulation that DEQ must "NOTIFY THE REGIONAL FISHERY MANAGER WITH A COMPLETE LIST OF DATES AND SAMPLE SITES PRIOR TO FIELD WORK." It is recognized this list may change. It is the responsibility of each DEQ regional office to update and provide IDFG with the most current information. It is the responsibility of each regional office to report to IDFG as required by the permit stipulation(s). It is also the responsibility of each DEQ office to discuss the stream list with the appropriate IDFG representative to identify streams known or likely to contain endangered species. Additionally, any concerns, requirements, and/or restrictions (i.e., spawning fish) need to be identified by the IDFG representative, documented, and communicated to the appropriate DEQ field crew, who must adhere to them.

Crew members need to completely read, understand, and adhere to the collection permit requirements. Usually the permit stipulates that a copy of the fish collection permit be kept with the crew in the field during electrofishing.

Idaho Department of Environmental Quality Fish Data Sheet

Location Information

Water Body Name _____ BURP Site Id _____

Location Description

_____

_____

Pass Information Pass ___ of ___

Collectors _____ Field Taxonomist _____

Date _____ Clarity _____ E-Fish Length _____

Avg Width _____ Water Temp (°C) _____ Conductivity _____

Electrofisher Model _____ Setting _____

Effort (seconds) _____ Voltage _____

Fish Collected

	Type	Length	Weight	Tag	Group	DEQ Code	Flag		Type	Length	Weight	Tag	Group	DEQ Code	Flag
1								22							
2								23							
3								24							
4								25							
5								26							
6								27							
7								28							
8								29							
9								30							
10								31							
11								32							
12								33							
13								34							
14								35							
15								36							
16								37							
17								38							
18								39							
19								40							
20								41							
21								42							
F1								F2							
F3								F4							
F5								F6							
F7								F8							

Figure 33. First page of fish data sheets.

3.3.14.3 Electrofishing

To maximize personal safety and minimize fish injury, a person with electrofishing experience and formal training should oversee BURP electrofishing. Effective but safe electrofishing requires understanding electricity in water, electrofishing safety, and electrofishing principles. Starting in 2004, DEQ will require electrofishing units to be certified annually by the factory. All DEQ employees must follow DEQ electrofishing policy. BURP Coordinators are responsible for making sure all crew members have read and understood the electrofishing safety information included in this manual as Appendix H and have signed the acknowledgement that they received electrofishing safety orientation before they do any electrofishing.

3.3.14.3.1 Electrofisher Preparation

Use standardized electrodes for BURP electrofishing. The cathode should be the "rat-tail" type with three times the surface area of the anode. The anode should be round, shiny, and 28 to 30 cm in diameter. Remove all plating from the anode with an abrasive pad weekly or as needed.

3.3.14.3.2 Electrofisher Settings

Electrofisher units should use pulsed DC set to the lowest voltage, frequency, and duty cycle combination that elicits galvanotaxis response and minimizes tetanus. Table 5 gives initial and maximum electrofisher settings recommended for BURP electrofishing.

Table 5. Guidelines for Initial and Maximum Setting Recommmendations for BURP Electrofishers

	Initial Settings	Maximum Settings
Voltage	100 V	1100 V for conductivity < 100 µS/cm[1] 800 V for conductivity[1] 100 – 300 µS/cm[1] 400 V for conductivity[1] > 300 µS/cm[1]
Pulse width	500µs[2]	5 ms[3]
Duty cycle	0.7%	30%
Frequency	15 Hz[4]	60 Hz[4]

1. microsiemens per centimeter
2. microseconds
3. milliseconds
4. hertz

3.3.14.3.3 Electrofishing Method

Be sure the site surveyed for fish includes all habitat types present in the reach if any are different than the BURP site. Electrofish a minimum of 100 meters of the stream reach after collecting macroinvertebrate and periphyton samples.

Follow the steps below for electrofishing and gathering the data from the fish:

- At a minimum, make one upstream pass without block nets. Proceed up the thalweg of the channel for streams whose wetted width is less than 5 meters and in a zigzag pattern in larger streams.
- Collect all fish. Assure that all collected fish are maintained in cool, well-oxygenated water. Take care to avoid damage or injury to the fish. Identify all fish to the lowest taxonomic level possible. Prepare equipment for measuring length (scales for weighing are optional) and the recovery chamber prior to applying anesthesia. Apply anesthesia as recommended in Chandler et al. (1993).
- Measure the total length of each fish.
- Voucher fish specimens as described below.
- Record the amount of time (number of seconds) spent on each electrofishing pass.
- Measure and record the specific conductivity in microsiemens per centimeter.
- Measure and record the water temperature.
- If the electrofished site is different than the BURP site, record latitude and longitude, stream length of the site, and average width at a minimum of three transects.
- Record fish type, length, weight (optional), and tag number for each vouchered fish.
- Group the fish by species. Use a different alphabetical character for all the fishes that appear to be the same species.
- Note the DEQ taxon code for each individual (see Appendix I).

3.3.14.4 Fish Vouchering

3.3.14.4.1 Vouchering Purpose

Vouchering of fish specimens is a QA procedure at DEQ and is a routine step in "good biological science." Lundberg and McDade (1990) recommend vouchering specimens for additional taxonomic identification and eventual deposit in a museum. The depository for DEQ fish (and macroinvertebrate) voucher specimens is the Orma J. Smith Museum of Natural History, Albertson College of Idaho, Caldwell. Vouchered specimens can also be used for public education, staff training, and research and evidence in beneficial use attainability, status, and environmental investigations.

3.3.14.4.2 Vouchering Policy

Voucher any fish that can not be identified to species in the field and some that have been field-identified for confirmation. Voucher enough specimens of each species from each site to document the range of size and individual characteristics of each species at that site. Five or six specimens of each species from each site is usually enough.
Vouchering of fish specimens must comply with any applicable scientific collection regulations and restrictions, particularly those specified in permits. DEQ fish collection permits need to specify the Orma J. Smith Museum as the depository for the vouchered material. The museum also needs a photocopy of the collection permit to document legal possession of vouchered materials.

3.3.14.4.3 Vouchering Procedures

1. Before beginning, read the formalin health and safety information in Appendix E of this manual.

2. **Each** fish must be tagged, using one tag per fish voucher. If possible, use a tag applicator (Quiltak or similar) to tag voucher fish with a Floy™ tag label. Tag small fish through the body below the dorsal fin on the right side, and tag larger fish into the body just below the dorsal fin on the right side. Figure 34 shows a tag placed through the body of a small fish. If it is not possible to use the tag applicator, use a wire through the mouth to attach the tag.

Figure 34. Small fish tagged through the body

3. Place tagged live specimens in 10% formalin solution as a fixing agent. Using live specimens allows the formalin solution to be ingested and respirated into the interior organs and tissues of the fish. If a specimen is over 300 mm (one foot) in total length, make a small incision in the abdomen and/or inject formalin into the large muscles. Be sure all the specimens are totally covered with formalin.

4. Label each sample jar according to the example in Figure 35. Each label must have at least the following: 1) stream name (water body), 2) site ID, 3) date, 4) collector's name, and 5) the jar count (e.g., 1 of 3, 2 of 3). When including paper labels with fish use archival grade heavy paper that can withstand storage in formalin solution (such as Resistall Paper 36#). Use alcohol-proof ink. Place one label inside the jar and tape a second label to the outside of the jar.

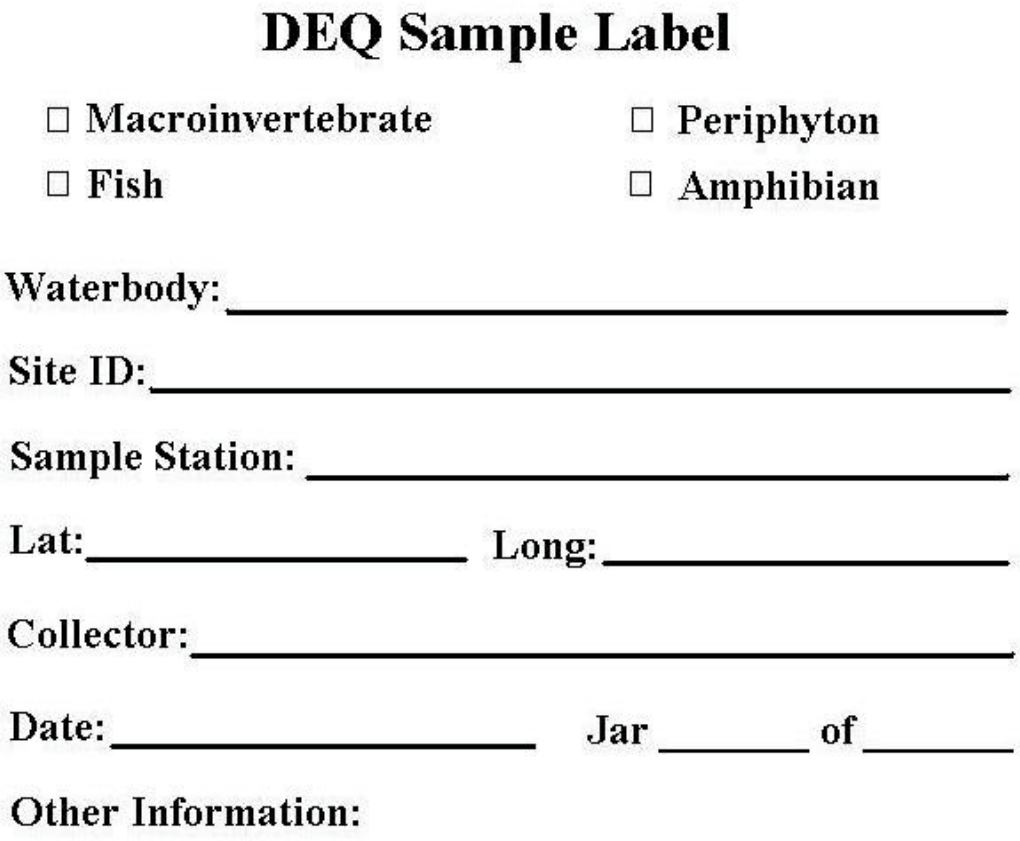

Figure 35. Sample of a fish label.

5. Ideally, each site should have one jar for all vouchered fish. The jars containing fish should be easy to distinguish from the jars containing other types of vouchered specimens. One way of ensuring this is to put a "Mr. Yuk" sticker on the fish jars.

6. The fish specimens from any one crew (region) must be kept separate from those of other crews and from other types of specimens. Do not mix fish and macroinvertebrate samples or different crews' fish samples together in one box. Each box of samples must be labeled with: 1) the regional (or state) office it is from, 2) the site IDs of the samples in the box, and the box count and total number of boxes (i.e., box 1 of 5, 2 of 5, etc.).

7. Before submitting the specimens to the lab for analysis, fill out the fish data sheet(s) (part of the BURP field forms) relating tag numbers to DEQ fish specimen labels. Make an initial field identification of the specimens being vouchered. Follow QA/QC instructions for lab submittal. Include the fish data sheet(s) with samples submitted to the lab.

8. When the monitoring season is finished, send all the samples (for one crew/region) to the laboratory in one shipment. Do not mix samples from more than one region in any one shipment to the laboratory. Notify the lab before sending samples. If possible, call the lab before the end of the season with a reliable estimate of the number of samples they will receive. This allows the laboratory to order necessary supplies and schedule employees to complete the work.

9. Send a legible copy of the field data sheets (original is preferred), a copy of the collection permit, and the specimens to the data management representative in the DEQ state office.

Idaho Division of Environmental Quality

Bacteria Check Sheet

Stream Name:		Site ID:	
HUC #:		Collection Date:	

1	Is Primary Contact Recreation a Designated or Existing Use	Yes	No	If Yes collect 1 sample *****
				if No collect 1 sample *******
2	Are upstream land uses affecting recreation use **	Yes	No	if Yes collect 1 sample *******
3	Other reasons ***	Yes	No	if Yes collect 1 sample *******

explain other reasons

collect 1	
collect 5	

** include agriculture, grazing, recreation, urban, cabins, septic

*** on 303d list for bacteria, etc.

***** if e-coli exceeds 406/100ml, collect 5 samples over 30 days

******* if e-coli exceeds 576/100ml, collect 5 samples over 30 days

Sample Results

sample #	date	time	location	E-coli results
sample #1				
sample #2				
sample #3				
sample #4				
sample #5				
sample #6				
			geometric mean	

* if sample #1 exceed standards, collect remaining 4 samples

other notes:

Figure 36. Sample of a Bacteria Field Form / Check Sheet

3.3.15 Bacteria (E. coli) Check Sheet

E. coli (Escherichia coli) is a bacteria found in the normal intestinal flora of warm-blooded animals. Its presence in water indicates that the water has been in contact with or been contaminated by fecal material, so BURP uses it as an indicator for bacteria and other pathogens. Although BURP currently analyzes for *E. coli*, the samples collected by this method could be analyzed for other bacteria.
Numerical criteria for *E. coli* are included in the state of Idaho water quality standards for protecting primary and secondary contact recreation beneficial uses (IDAPA 58.01.02.210.01-.02). The designated beneficial use is determined in the office before the field visit..

Each site is screened, using the process described below, to determine if the site potentially has sources of *E. coli*. If it does, a bacteria sample is collected from the site and submitted for laboratory analysis. If that sample contains *E. coli* at a level that exceeds a standard threshold, five additional samples are collected within 30 days.

3.3.15.1 Bacteria Screening

At each BURP survey site, follow the screening process and complete the screening form shown in Figure 36 to determine if bacteria sampling is required.
DEQ's screening process uses the following questions:

- Is primary contact recreation a designated beneficial use? If **yes**, apply primary contact recreation threshold values for exceedances.

- Are swimming/bathing areas located within the reach; is there evidence of swimming/bathing within the reach; has swimming/bathing been observed in the reach? If **yes**, apply primary contact recreation threshold values for exceedances.

- Do upstream land uses have the potential for increasing bacteria concentration? Examples of such land uses are agriculture, grazing, urban development, waste water treatment facilities, septic tanks, and cabins. If **yes**, apply secondary contact recreation threshold values for exceedances.

- Are there other reasons that bacteria should be collected? For example, has the stream had bacteria problems in the past? Has the public filed complaints on the stream? Are there other reasons to expect a bacteria problem? If so provide a description of these reasons. **For any of these reasons**, apply secondary contact recreation threshold values for exceedances.

If any of the above questions were answered yes, collect one grab sample for laboratory analysis, using the method given below. If an exceedance of the applicable threshold value occurs according to the criteria given below, follow up by collecting five samples within a 30-day period.

To determine if a threshold exceedance has occurred (requiring additional sample collection), refer to the Idaho water quality standards, IDAPA 58.01.02.210.01-.02. The threshold values for *E. coli* bacteria are currently 406 organisms per 100 ml for primary contact recreation and 576 organisms per 100 ml for secondary contact recreation.

3.3.15.2 Bacteria Sample Collection

For BURP monitoring, bacteria samples must be taken following standard methods (American Public Health Association 1998). Follow these guidelines:

- Take bacteria samples in nonreactive borosilicate glass or plastic bottles that the laboratory has prepared. The laboratory should then add sodium thiosulfate ($Na_2S_2O_3$). Sodium thiosulfate dechlorinates and neutralizes any residual halogens that prevent continuation of bacterial action during sample transit. Sodium thiosulfate is usually intended for dechlorinating chlorinated wastewater effluents and drinking water. The use of sodium thiosulfate may not be necessary for surface waters (unchlorinated) but its use is recommended for standardization and will not negatively affect surface water samples. If you must prepare them, be sure they are cleaned and rinsed carefully, given a final rinse with deionized or distilled water, and sterilized.

- When filling a sample bottle, leave ample air space (at least 2.5 cm) to facilitate mixing by shaking before examination.

- Collect samples from the thalweg of the stream.

- Use aseptic techniques to avoid sample contamination. Leave each sample bottle closed until it is to be filled. Remove the stopper or cap as a unit; do not contaminate the inner surface of the stopper or cap and neck of the bottle. Fill the bottle without rinsing. Replace the stopper or cap immediately. The volume of the sample should be sufficient to carry out all tests required, preferably not less than 100 ml.

  Follow these collection steps:

  1. Stand facing upstream in the thalweg at the sample collection location.

  2. Remove the sample bottle cap.

  3. Invert the sample bottle and dip it to arm's length, not more than 80% of depth.

  4. Revert the bottle while drawing upward; this approximates depth integration.

  5. Pour out excess water to leave ample air space.

  6. Recap the sample bottle.

  7. Place the sample in a cooler with ample ice to maintain 4 °C.

  8. Deliver the sample to the laboratory within the specified holding time, currently 30 hours.

9. Do not submit samples for analysis if they have exceeded the holding time specified by the laboratory. Currently the state laboratory closes at 4:30, so bacteria samples must be there by 4:00.

- Perform the following QA protocols for bacteria sampling:

1. Collect 10% "blank" samples (i.e., after every 10 samples, collect one blank) by substituting steps 3 and 4 above with filling a sample bottle with deionized water.

2. Also collect 10% duplicate samples (i.e., after every 10 samples, collect one duplicate).

3. Always complete proper labeling and field documentation to demonstrate compliance with sampling protocol and to reduce contamination of sample bottles.

4 Completing Followup of BURP Field Activities

After the main field activities are finished, there are a few things that must be done before leaving the site, while leaving the site, and after returning to the office. They are shown in the last box in Figure 37.

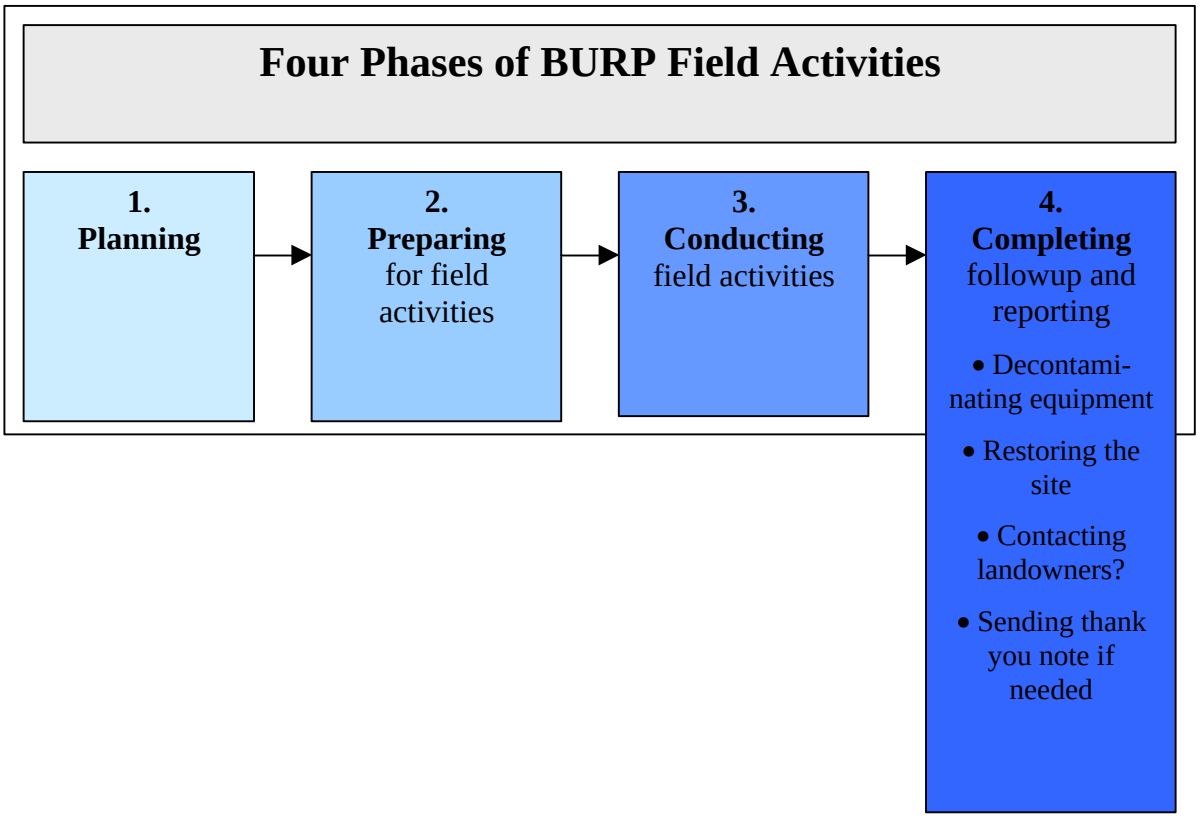

Figure 37. Steps in the Followup phase.

4.1 While Still in the Field

4.1.1 Decontaminating Equipment

Decontamination entails making BURP equipment and the area safe by eliminating harmful substances.

DEQ does not want its monitoring activities to cause the spread of noxious weeds, diseases of aquatic organisms, or exotic flora and fauna. Take special care to perform decontamination steps before moving from one area to another.

The basic method BURP uses to avoid the spread of weed seeds, diseases, and exotic organisms is simple sanitation. This sanitation can mostly be accomplished by keeping waders, monitoring

equipment, and vehicles clean of mud and debris (Oregon Department of Environmental Quality 2001). Clean or rinse any contaminated items with water to thoroughly remove mud, weeds, and other debris. Dry them completely.

The U.S. Fish and Wildlife Service (2001) recommends the following for the prevention of the spread of the New Zealand mudsnail: rinse and clean sampling gear, waders, and equipment after each use; use separate sets of sampling or wading gear; and give equipment a hot-water bath (50 °C, 120 °F) for several minutes. They also note that dry heat will kill the New Zealand mudsnail and that waders can be sprayed with soap solutions and allowed to dry in the hot sun for several hours.

The Oregon Department of Environmental Quality (2001) recommends soaking equipment in a 10% chlorine bleach solution for 10 minutes to kill whirling disease spores. Follow by rinsing and drying equipment in the shade. They caution that chlorine is a reactive chemical that can damage some equipment with prolonged contact.
Lazorchak (2001) and Lazorchak and Averill (2001) recommend cleaning up and properly disposing of all waste material generated at the stream or river sampling site and transporting it out of the area as necessary.

4.2 When Leaving a Site

4.2.1 Restore the Site to the Way it Was Upon Arrival

Make every effort to restore the site to the condition it was in when the crew arrived. Be sure to remove all markers, stakes, and ribbons as well as all equipment and supplies. Leave all gates as they were; open if they were open and closed if they were closed. If at all possible, avoid driving over soft terrain which can leave damaging vehicle tracks.

4.2.2 Contact the Landowner

Many private landowners and public lands caretakers appreciate being contacted by the BURP crews as they leave a site. If it is feasible, try to contact the landowner or caretaker when leaving to express thanks and to notify them of your departure from the property. It is often helpful to convey any positive comments regarding their property or the stream. If they ask about indications of impairment, be honest but do not theorize or place blame for any degraded conditions you observed.

4.3 Back in the Office

There are several things that must be done back in the office, some immediately, some within a few days:

- Submit samples to the lab.
- Handle data properly, filing notes and other information.
- Send thank you notes to landowners and caretakers that you didn't contact in person when leaving their sites.

5 Quality Assurance and Quality Control

The data collected in the field is of little use unless its quality is assured by QC practices. In order for DEQ to make maximum use of the BURP data, it is essential that the BURP protocols in this field manual and the QC practices in the QA/QC manual, *Beneficial Use Reconnaissance Program Quality Assurance Plan for Field Data Sheets and Data Handling on Wadeable (Small) Streams (IDEQ 2002) are followed.*

Collection of reliable and accurate monitoring and measurement data is the goal of the QA program. DEQ's QA program enhances data accuracy, reliability, and consistency, through 1) annual BURP Coordinator workshops, 2) extensive BURP field crew training, 3) consistent crew supervision, 4) comprehensive field audits, and 5_) various QA/QC activities. Each of these is discussed below.

5.1 BURP Coordinator Workshops

Each year, BURP coordinators review BURP protocols, to learn new BURP methods, and exchange ideas on improving data collection efficiency and accuracy during several meetings and one workshop The workshop is conducted before each field season and provides training materials and instruction methods, training on new methods, and examples of properly recorded measurements. If any protocols are changed, the BURP Field Manual is updated accordingly.

5.2 Crew Management

Because of the many variables measured and samples taken, training the seasonal crews is essential for the success of the BURP program. DEQ strives for statewide consistency of the monitoring data and has chosen mandatory centralized training of the BURP field crews as the best way to accomplish this objective. All crew members receive comprehensive and consistent training about DEQ policies and BURP methods. This includes new crew members and "returnees," those who have worked on a BURP crew before. Crews are usually trained during the last two weeks in June, before the field season starts July 1. Currently, the training takes eight full days. It includes a small amount of lecture in the office, but is mainly done in the field. The crews learn all aspects of the methods presented in the BURP Field Manual. The majority of the training consists of hands-on demonstrations first by the DEQ instructors, then by the crew members, to demonstrate their ability to perform each method. Other training methods include viewing instructional materials and lecture and discussion sessions. The crews are introduced to as many different types of streams, land uses, and ecoregions as possible during the training.

BURP crew members receive extensive training before beginning field work. They learn the correct procedures for taking samples and measurements and how to properly fill out the BURP field forms, an important part of accurate data entry and overall quality assurance. In addition, they receive important information about personal safety, QC, vehicle and equipment maintenance, and proper etiquette.

5.3 Supervision of Crew Adherence to Standards

Each BURP crew is supervised throughout the monitoring season by a BURP Coordinator who accompanies crews periodically throughout the monitoring season to ensure their continuing adherence to the BURP Field Manual and DEQ policy.

5.4 Field Audits

A field audit team consists of one or more members of the DEQ state office staff, accompanied by a BURP Coordinator from another DEQ region who was involved with the centralized BURP crew training. The audit team observes BURP crews performing measurements and collecting and preserving samples at a BURP site. Each BURP crew is audited within approximately two weeks of crew training. Each crew is audited at least once per season. The BURP Coordinators use the audit findings to ensure the crew's performance is consistent and adheres to BURP methods to meet QA requirements.

After the audit is completed, the audit team briefs the BURP crew on-site. The audit team prepares a written report of the audit results immediately following the audit and distributes it to DEQ regional managers, BURP Coordinators, and other staff.

5.5 Quality Assurance

5.5.1 Data Handling

Data handling by BURP crews and coordinators prior to submittal to the state office is considered part of the sampling process. The data handling process at the state office is guided by the most recent version of the QA/QC manual (currently, the *Beneficial Use Reconnaissance Program Quality Assurance Plan For Field Data Sheets and Data Handling on Wadeable (Small) Streams* [DEQ 2002]). Briefly, the QA process requires review of data sheets by the DEQ state office QA crew and data entry by DEQ's data management staff in the state office Technical Services Division.

5.5.2 Sample Handling

BURP crews are trained to handle all samples as gently as possible and to take extra care with macroinvertebrate samples, as excessive shaking and jarring can destroy macroinvertebrate samples. Crews are also trained on how to label samples correctly and on the importance of correct labeling.

5.5.3 Sample Vouchering

New (1998) and Bailey et al. (2001) strongly recommend that voucher specimens be archived for future reanalysis, identification, and other research. Voucher specimens should be stored in appropriate containers and preservatives. Voucher labels should include necessary information such as location, date, and collector's name, and be printed on archival paper. Presently, most BURP specimens are deposited in the Orma J. Smith Museum of Natural History, Albertson College of Idaho, Caldwell. Amphibian specimens are also deposited at the Idaho Museum of Natural History, Idaho State University, Pocatello. Voucher specimens that are deposited at the

museums are then available for any later verification that might be needed and for future research opportunities. DEQ will continue to support voucher specimens as resources allow.

5.5.4 Equipment Calibration

Calibrating the equipment means adjusting precisely for a particular function.
In order to obtain the most accurate and precise information, the BURP Coordinators are responsible for calibrating or standardizing each piece of monitoring equipment that requires it before each field season. Calibrating a piece of equipment tells how accurate its measurements are. Equipment calibration also insures the integrity of the data.
Before the beginning of each monitoring year, the conductivity meter, flow meter, and electrofishing unit must be sent in for factory calibration and maintenance. The field crew inspects the lab-grade and field thermometers weekly and calibrates them monthly to confirm instrument integrity. The field crew also calibrates the conductivity meter monthly. The crew maintains a calibration log for each instrument.

5.6 Data Analysis and Interpretation

This field manual describes how to conduct a survey following the BURP process. This description includes BURP survey assumptions, methods, data handling, and required equipment. This document is not intended to describe the analysis and interpretation of the data collected. That information is found in the *Water Body Assessment Guidance* (Grafe et al. 2002a).

6 Safety

DEQ takes safety very seriously. Consequently, there are several policies to ensure safety when performing monitoring activities. These include mandatory training in cardiopulmonary resuscitation (CPR) and first aid, hazardous substances, and electrofishing safety. DEQ also provides comprehensive training regarding employment and safety policies during regional orientation and centralized training.

6.1 CPR and First Aid

All BURP crew members and DEQ staff who perform monitoring activities must be trained and certified in CPR and first aid to increase safety during all BURP field work, particularly during training and electrofishing.

6.2 Hazardous Situations and Substances

6.2.1 Hazardous Materials

No BURP crew member is authorized to endanger his life or the lives of others with exposure to hazardous materials, laboratory waste, or drug paraphernalia. DEQ provides training to help identify potentially hazardous substances and situations that may be found at monitoring sites or during travel. This training is intended to provide awareness and to help crew members recognize these materials if they are encountered. Crew members are not trained or authorized to deal with hazardous materials found in the field. BURP Coordinators in consultation with HazMat Coordinators are encouraged to develop their own additional training programs specific to their regional areas.

Crew members are not authorized to collect or transport hazardous materials found in the field. However, they are authorized to determine the GPS coordinates of a site if it can be done without undue exposure and to report the site to the BURP Coordinator, who will then report it to the regional office HazMat Coordinator. Safety comes first in any situation.

BURP crews use a reduced concentration of formalin to preserve some samples in the field (currently fish and periphyton). Appendix E provides information on how to handle formalin safely.

6.2.2 Abandoned Mining Sites

BURP training includes awareness of safety issues surrounding abandoned mining sites. Crew members are not authorized to visit or enter abandoned mine land sites (especially adits and tunnels) without notifying the BURP Coordinator and the Abandoned Mine Lands Coordinator. BURP crews are not authorized to take water samples from abandoned mine land sites where ground water is discharging into a surface stream.

6.2.3 Laboratory Waste and Drug Paraphernalia

BURP training includes discussions of safety and health issues surrounding laboratory waste and drug paraphernalia that sometimes appears on public lands. Crew members are not authorized to collect or transport laboratory waste or drug paraphernalia without written authorization from the Regional Manager for Water Quality Protection. If possible without exceeding the exposure level or otherwise risking the health and safety of crew members and others, crew members may take GPS readings of the site (or near the site) and to report them to the BURP Coordinator, who will then report them to the HazMat Coordinator immediately for follow up.

6.3 Electrofishing

DEQ has several policies to address electrofishing safety issues. Specifically, DEQ has an electrofishing safety plan (Appendix H) that addresses safety issues concerning training, equipment, and procedures. BURP Coordinators, crew members, and other DEQ staff performing electrofishing activities must carefully review these policies and sign a form acknowledging they have received electrofishing orientation. DEQ also uses an electrofishing checklist to ensure equipment needs are met and safety issues are addressed (Appendix J).

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8 Glossary

See the *Glossary of Aquatic Habitat Inventory Terminology* (Armantrout 1998) for a more complete glossary of aquatic habitat inventory terminology.

alluvial – related to material deposited by running water.

anode - the positive electrode.

anthropogenic-resulting from the influence of human beings on nature.

aquatic - pertaining to water; in this context, usually refers to plants or animal life living in, growing in, or adapted to water.

attainable use - a beneficial use that, with improvement, a waterbody could support in the future.

backwater pool – a pool caused by an eddy along the channel margin or by back-flooding upstream from an obstruction such as large woody debris, boulders or root wads.

bankfull depth – depth of water measured from the surface to the channel bottom when the water surface is even with the top of the streambank.

bank stability – the resistance of a bank to erosion.

beneficial use - any of the various uses that may be made of water, including, but not limited to, water supply (agricultural, domestic, or industrial), recreation in or on the water, aquatic biota, wildlife habitat, and aesthetics.

benthic zone – the bottom or bed of a water body.

canopy closure – the percentage of ground or water covered by shade from the outermost perimeter or natural spread of foliage from plants.

cascade – a highly turbulent series of short falls and small scour basins, with very rapid water movement as it passes over a steep channel bottom with gradients exceeding 8%.

cathode – the negative electrode.

chute – a narrow, confined channel through which water flows rapidly and smoothly; chutes are a class of runs.

conductivity – a measure of the ability of an aqueous solution to carry an electric current.

corner pool – see **meander pool.**

criteria - either a narrative or numerical statement of water quality on which to base judgement of suitability for beneficial use.

dammed pool – impoundment upstream of a complete or nearly complete channel blockage.

density – mass per unit volume.

designated use – a beneficial use listed for a waterbody or waterbodies in a state's water quality regulations.

discharge - commonly referred to as flow, expressed as volume of fluid per unit time (e.g. cubic feet per second) passing a particular point, in a river or channel or from a pipe.

eddy – a pool on the margin or off the main channel of a stream that is formed and maintained by strong eddy currents.

electrofishing – The use of electricity to provide a sufficient electrical stimulus in fish to permit easy capture by netting.

existing use - a beneficial use actually attained by a waterbody on or after November 28, 1975.

eutrophication - the process of nutrient enrichment in aquatic systems, such that the productivity of the system is no longer limited by the availability of nutrients. This is a natural process but may be accelerated by human activities.

***Escherichia coli* -** This bacteria, often referred to simply as *E. coli*, is found in the normal intestinal flora of warm-blooded animals. It is pathogenic and its presence in water indicates that the water has been in contact with or contaminated by fecal material.

floodplain – land beyond a stream channel that forms the perimeter for the maximum probability flood.

fluvial – pertaining to or living in streams or rivers, or produced by the action of flowing water.

formalin – a 37 percent by weight aqueous solution of formaldehyde with some methanol.

glide – a portion of the stream with slow-moving, relatively shallow water. The water surface has little or no turbulence, and the stream bottom is flat or slightly convex in shape, lacking the scour associated with the pool.

grab sample – a single sample collected at a particular time and place.

habitat – the place where a population lives, and its living and non-living surroundings.

high gradient riffle – a collective term for rapids and cascades.

HUC – a watershed numbering system developed by the U.S. Geological Survey.

integrity – the extent to which all parts or elements of a system (e.g. aquatic ecosystem) are present and functioning.

interrupted flow – water flowing alternately on the channel surface in some stream reaches and disappearing underground in others.

laminar flow – uniform streamflow with no mixing or turbulence.

lateral scour pool – a pool that forms around local obstructions such as boulders or individual logs.

low gradient riffle – shallow reaches with swiftly flowing turbulent water with some partially exposed substrate, usually cobble or gravel.

macroinvertebrate – an invertebrate (without backbone) animal, large enough to be seen without magnification and retained by a 0.6mm screen.

meander pool – a pool resulting from a shift in the channel direction (meander) and found along the outer curves of the channel, where scouring occurs.

monitoring - to check or measure water quality (chemical, physical, or biological) for a specific purpose, such as attainment of beneficial uses.

nonpoint source - referring to pollution originating over a wide geographical area, not discharged from one specific location.

organic – materials resulting from vegetative growth, decay, and accumulation in closed basins or on gentle slopes where the rate of accumulation exceeds that of decay.

organism – any living thing composed of one or more cells.

periphyton - a term for benthic algae, which is commonly used to refer to all of the microflora on substrata.

phreatohpyte – a plant whose roots generally extend downward to the water table; phreatophytes are common in riparian habitats.

plunge pool – a pool created by water passing over or through a complete or nearly complete channel obstruction, and dropping steeply into the streambed below scouring out a basin in the stream substrate where the flow radiates from the point of water entry.

point source – any discernable, confined, or discrete conveyance of pollutant, such as a pipe, ditch, or conduit.

pollution – any alteration in the character or quality of the environment due to human activity that makes it unfit or less suited for beneficial uses.

pool – an aquatic habitat in a stream with a gradient less than 1% that is normally deeper and wider than aquatic habitats immediately above and below it.

protocol – a collection of methods.

quality assurance – (QA) A program organized and designed to provide accurate and precise results. Examples include selection of proper technical methods, evaluation of data, quality control, and training of personnel. Its goal is to assure the data provided are of the quality needed and claimed.

quality control – (QC) Routine application of specific actions providing information for the quality assurance program. Examples include standardization, calibration and replication.

rapids – a moderately steep stream area with supercritical flow between 15 and 50%, rapid and turbulent water movement, surface with intermittent whitewater with breaking waves, coarse substrate, with exposed boulders at low flows, and a somewhat planar longitudinal profile.

reach – a relatively homogeneous stretch of a stream having a repetitious sequence of physical characteristics and habitat types; any specified length of a stream.

reconnaissance – an exploratory or preliminary survey of an area.

representativeness – the measure of the degree to which data accurately and precisely represent a characteristic of a population or environmental condition.

least impacted (reference) conditions – conditions which fully support applicable beneficial uses, with little impact from human activity and representing the highest level of support attainable.

riparian zone – natural home for plants and animals occurring in a thin strip of land bordering a stream or river; dominant vegetation often consists of phreatophytes.

riffle – a shallow reach with low subcritical flow in alluvial channels of finer particles that are unstable, characterized by small hydraulic jumps over rough bed material, causing small ripples, waves, and eddies, without breaking the surface tension.

riffle crest – the shallowest continuous line (usually not straight) across the channel close to where a water surface becomes continuously riffled.

river – the larger of BURP's two size designations for flowing water

run – a portion of the stream with swiftly flowing, relatively deep water, which approximates uniform flow. There are no major flow obstructions and little or no surface turbulence.

sample – a set of units or elements selected from a larger population, typically to be observed for making inferences regarding that population.

scour pool – a pool created by the scouring action of current flowing against an obstruction, causing an increase in lift and drag forces; a result of flow deflection, constriction, or increased local turbulence induced by a nonalluvial obstruction.

sediment – fine fragmented materials from weathered rocks and organic material that are suspended in, transported by, and eventually deposited by water or air.

sinuosity – the ratio of channel length between two points in a channel to the straight line distance between the same two points. Channels with sinuosities of 1.5 or more are called "meandering", while those close to 1.0 are called "straight".

stratification – the arrangement of water masses into distinct, horizontal layers that are separated by differences in density associated with water temperature and dissolved or suspended matter.

stream – a natural water course containing flowing water, at least part of the year, together with dissolved and suspended materials, that normally supports communities of plants and animals within the channel and the riparian vegetation zone.

stream order – hierarchical ordering of streams based upon the degree of branching. By the Strahler (1957) method, a first-order stream is an unforked or unbranching stream. Two first-order streams flow together to form a second-order stream, two second-order streams combine to make a third-order stream etc.

streambank – ground bordering a channel above the streambed and below the level of rooted vegetation that often has a gradient steeper than 45^{o} and exhibits a distinct break in slope from the stream bottom.

streambed - substrate plane, bounded by banks, of a stream bottom.

stream channel – a long, narrow depression shaped by the concentrated flow of a stream and covered continuously or periodically by water. Also, bed and banks formed by fluvial processes where a natural stream of water runs continually or intermittently.

stream classification – systems used to group or identify streams possessing similar features using geomorphic structure, water source, associated biota, or other characteristics.

streamflow – flow of water, generally with its suspended load, in a well-defined channel or water course.

substrate – mineral and organic material forming the bottom of a waterway or water body.

surface water – the collection of all natural bodies of water, including but not limited to streams, lakes, and wetlands, evident on the surface of the land.

targeted survey – the use of best professional judgement to choose sampling locations.

thalweg – a line joining the deepest points along successive cross-sections of a river channel.

trench pool – a pool that forms in a slot-like depression, usually found in bedrock channels; trench pools typically have long linear shapes.

turbidity – the reduction of transparency in water due to the presence of suspended particles.

turbulence – streamflows in which the velocity at a given point varies erratically in magnitude and direction and disrupts reaches with laminar flow.

waterbody – a specific body of water or geographically delimited portion thereof.

water quality – a term for the combined chemical, physical, and biological characteristics of water which affect its suitability for beneficial use.

wastewater - treated or untreated sewage, industrial waste, or agricultural waste and associated solids.

watershed – region or area drained by surface and groundwater flow in rivers, streams, or other surface channels. Also, the divide between two catchment (drainage) areas.

wetted width – the width of a water surface measured perpendicular to the direction of flow at a specific discharge.

width:depth ratio (W/D) – an index of the cross section shape of a stream channel, at bank-full level.

9 Index of Monitoring Variables

Acknowledgements

The Beneficial Use Reconnaissance Program Field Manual has evolved since 1993 into its present form. Many people have contributed to the effort in the past.
This field manual was assembled with the assistance of the Beneficial Use Reconnaissance Program Technical Advisory Committee (Sean Woodhead, William H. Clark, Dave Hull, Angie Petersen, Glen Pettit, Cynthia Grafe, Steve Robinson and Daniel Stewart). Valuable review and comments were received from Barry Burnell, Michael McIntyre, Cynthia Barrett, Darren Brandt, Dr. Sonny Buhidar and Don Zaroban. Technical peer review was provided by Bob Steed and technical editing by Lisa Hansen.

Appendix A

Sample Letter of Invitation to an Aquatic Monitoring Coordination Meeting

To Whom It May Concern:

The Idaho Department of Environmental Quality invites you to attend the 2002 Interagency Monitoring Coordination workshop. This once-a-year opportunity will allow you to network, exchange ideas, coordinate monitoring and become aware of the aquatic activities and/or monitoring proposed for this year in your areas of interest. Topics will revolve primarily around aquatic monitoring and restoration activities. Meeting attendees include representatives from private, local, state, and federal agencies.

If you plan to attend, please be prepared to give a brief overview of your aquatic monitoring/restoration activities this year and information detailing specific monitoring activities and locations. If you do not plan to attend, please send information indicating the type of monitoring you will be doing this year, location of this monitoring, and a contact name. In addition, please review the attached mailing list and provide me with any other pertinent contact names. We wish to insure this group is aware of all monitoring occurring within the basin.

Also, if you have any summaries from last year's efforts, please bring them as well. Attached is a proposed agenda for the meeting and mailing list. It is flexible so we can add more presenters if necessary.

This year's meeting will be held on (insert your date) at the DEQ Office, (insert your location). We will begin promptly at (insert the starting and ending times of the meeting). If you have any questions or suggestions, please contact me.

Sincerely,

(Name)

BURP Coordinator

DEQ (Address)

Phone: (208) (Phone Number)

email: (email address)

Appendix B

Informative Flyer About BURP Monitoring Activities

BENEFICIAL USE RECONNAISSANCE PROGRAM (BURP)

The Department of Environmental Quality (DEQ) **Beneficial Use Reconnaissance Program (BURP)** crews gather data from stream monitoring and from outside agencies to determine water quality conditions of Idaho streams.

There is one crew based in each of DEQ's six regional offices.

The crews:

- Work outdoors, camping and hiking to monitoring sites
- Monitor water quality
- Collect fish and aquatic insects
- Perform stream bank surveys

DEQ tries to monitor the quality of the waters in all
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For more information, contact

The Department of Environmental Quality
1410N. Hilton, Boise, ID 83706
(208) 373-0502

Appendix C

Field Equipment Checklist

Field Equipment Checklist

MACROINVERTEBRATE SAMPLE EQUIPMENT	Yes	No
Hess and Surber Samplers (500 µm mesh w/300 ml bucket)		
White pans		
Macro sample containers		
Preservative (95% ethanol)		
Spare nets for Samplers		
Scrub brush		
(wash) bottles for rinsing (water and alcohol)		
Field labels		
Field Data Forms		
Rubber gloves		
Flexible forceps (larval)		
Pencils/Indelible alcohol proof markers		

PERIPHYTON SAMPLING EQUIPMENT	Yes	No
Periphyton sampler		
Periphyton brush		
Pipette		
10% formalin solution & dropper		
Labels		

WOLMAN PEBBLE COUNT EQUIPMENT	Yes	No
Metric ruler (clear plastic) or angled measuring device listed in Protocol #2		
Shoulder-length gloves		
Pencils/pens		
Field data sheets		
ELECTROFISHING EQUIPMENT	Yes	No
Collecting Permits or IDFG personnel		
Electrofisher		
Anode and Cathode		
Dip nets		
Waders (non breathable, non conductive material)		
Rubber gloves (shoulder-length)		
Specific Conductivity Meter		
Preservative: 10% buffered formalin solution		
Thermometer		
Small aquarium nets		
Anesthetic		
Buckets		
Gas/oil and spare spark plugs (if using gas-powered electrofisher)		
Generator (if using a battery-powered electrofisher) and spare parts		
Spare fuses		
Specimen vouchering containers		

Fish measuring board		
Fish identification keys		
Clipboard/notebook/fish labels		
Field data sheets		
First Aid Kit		
Polarized sunglasses		
Fire extinguisher		

FLOW MEASUREMENT EQUIPMENT	Yes	No
Current velocity meter		
Top-setting-wading rod		
100 m measuring tape (minimum length)		
Rebar stakes		
Flow sheets		
Pencils/clipboard		
Waders		
Extra batteries for current meter		

BACTERIA SAMPLING EQUIPMENT	Yes	No
Bacteria check sheet		
Sterilized bacteria sample bottles		
Labels/label tape		
Indelible marker		
Cooler with ice		

MISCELLANEOUS EQUIPMENT	Yes	No
First Aid Kit		
Sunscreen		
Emergency equipment for vehicle		
GPS receiver		
Tool Kit		
Clinometer		

Densiometer		
2 meter rod		
Tape measures		
Random number table		
Field notebook/clipboards		
Maps		
"All" forms and labels		
Camera & film		
Extra batteries		
Current BURP Field Manual and Workplan		
IDEQ/Other Protocols		
Pens/pencils		
Duct Tape		
String		
Flagging		

Appendix D

Material Safety Data Sheets (MSDS)

001 03/30/99 ETHANOL RED BAND III 190 PROOF

Section 1. Chemical Product

Product Name:	Ethanol Red Band III 190 proof
MSDS #:	CM0287
Date Issued:	3/29/99
Supersedes:	New
Issued By:	000099
Synonym:	Not available.
Trade Names:	Not available.
Material Uses:	Not available.

Section 2. Composition and Information in Ingredients

NAME	CAS #	% BY Weight	EXPOSURE LIMITS
Ethanol	64-17-5	90-95	TWA: 1880 (mg/m3) from ACGIH (TLV) TWA: 1000 (ppm) from ACGIH (TLV) TWA: 1900 (mg/m3) from OSHA TWA: 1000 (ppm) from OSHA
Water	7732-18-5	5	Not available.
Methyl alcohol	67-56-1	3-4	TWA: 262 STEL: 328 (mg/m3) from ACGIH (TLV) TWA: 200 STEL: 250 (ppm) from ACGIH (TLV) SKIN TWA: 260 STEL: 328 (mg/m3) from OSHA TWA: 200 STEL: 328 (ppm) from OSHA
Ethyl acetate	141-78-6	0-2	TWA: 1440 (mg/m3) from ACGIH (TLV) TWA: 400 (ppm) from ACGIH (TLV) TWA: 1400 (mg/m3) from OSHA TWA: 400 (ppm) from OSHA
Methyl isobutyl ketone	108-10-1	0-2	TWA: 205 STEL: 307 (mg/m3) from ACGIH (TLV) TWA: 50 STEL: 75 CEIL: 125 (ppm) from ACGIH (TLV) TWA: 410 STEL: 307 CEIL: 510 (mg/m3) from OSHA TWA: 100 STEL: 75 (ppm) from OSHA
Light aliphatic solvent naphtha (petroleum)	64742-89-8	0-2	Not available.

Ingredients not precisely identified are proprietary or nonhazardous under Federal Hazard Communication Standards (29 CFR 1910.1200).

Section 3. Hazards Identification
Physical State and Appearance - Liquid.

Emergency Overview
WARNING!
Keep away from heat, sparks and flame. Avoid contact with eyes. Avoid breathing vapors or spray mists.
Avoid contact with skin and clothing. Keep container closed. Use only with adequate ventilation. Wash
thoroughly after handling.

Routes of Entry
Dermal contact. Eye contact. Inhalation. Ingestion.
Potential Acute Health Effects
Eyes
Hazardous in case of eye contact (irritant).
Skin
Sensitization of the product: Not available.
Very hazardous in case of skin contact (irritant).
Slightly hazardous in case of skin contact
(permeator). Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.
Inhalation
Slightly hazardous in case of inhalation.
Ingestion
Slightly hazardous in case of ingestion.
Potential Chronic Health Effects
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH (Ethanol). Classified A4 (Not classifiable for human or animal.) by ACGIH (Ethyl acetate).
MUTAGENIC EFFECTS: Not available.
TERATEGENIC EFFECTS: Not available.
Medical Conditions Aggravated by Overexposure:
Repeated or prolonged exposure is not known to aggravate medical condition.
Overexposure/Signs/Symptoms - Not available.
See Toxicological Information (Section 11)

Section 4. First Aid Measures
Eye Contact
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.
Skin Contact
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds,

crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation
persists, seek medical attention. Wash contaminated clothing before reusing.

Hazardous Skin Contact

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation

Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Hazardous Inhalation

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Hazardous Ingestion - Not Available.

Notes to Physician - Not available.

Section 5. Fire Fighting Measures

Flammability of the Product
Flammable.
Auto-ignition Temperature
The lowest known value is 363 deg C (685.4 deg F) (Ethanol).
Flash Points
The lowest known value is CLOSED CUP: -4.4 deg C (24.1 deg F).
OPEN CUP: -4 deg C (24.8 deg F). (Cleveland). (Ethyl acetate)
Flammable Limits
The greatest known range is LOWER: 6% UPPER: 36.5%
(Methyl alcohol)
Products of Combustion
These products are carbon oxides (CO, CO2).
Fire Hazards in Presence of Various Substances
Flammable in presence of open flames and sparks, of heat, of combustible materials.
Slightly flammable to flammable in presence of oxidizing materials.
Explosion Hazards in Presence of Various substances
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Fire Fighting Media and Instructions
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.
Protective Clothing (Fire)
Be sure to use an approved/certified respirator or equivalent.
Special Remarks on Fire Hazards

Containers should be grounded. (Ethanol)
Special Remarks on Explosion Hazards - Not available.

Section 6. Accidental Release Measures
Small Spill
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.
Large Spill
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed.
Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7. Handling and Storage
Handling
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/vapor/spray. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.
Storage
No specific storage is required. Use shelves or cabinets sturdy enough to bear the weight of the chemicals. Be sure that it is not necessary to strain to reach materials, and that shelves are not overloaded.

Section 8. Exposure Controls/Personal Protection
Engineering Controls
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.
Personal Protection
Eyes - Splash goggles.
Body - Lab coat.
Respiratory - Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Hands - Gloves.
Feet -Not applicable.
Personal Protection in Case of a Large Spill
Splash goggles. Full suit. Vapor respirator. Boots.
Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product.
Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Chemical Name or Product Name	Exposure Limits
Ethanol	**TWA: 1880 (mg/m3) from ACGIH (TLV)**
	TWA: 1000 (ppm) from ACGIH (TLV)
	TWA: 1900 (mg/m3) from OSHA

	TWA: 1000 (ppm) from OSHA
Methanol	TWA: 262 STEL: 328 (mg/m3) from ACGIH (TLV)
	TWA: 200 STEL: 250 (ppm) from ACGIH (TLV)
SKIN	
	TWA: 260 STEL: 328 (mg/m3) from OSHA
	TWA: 200 STEL: 328 (ppm) from OSHA
Ethyl acetate	TWA: 1440 (mg/m3) from ACGIH (TLV)
	TWA: 400 (ppm) from ACGIH (TLV)
	TWA: 1400 (mg/m3) from OSHA
	TWA: 400 (ppm) from OSHA
Methyl isobutyl ketone	TWA: 205 STEL: 307 (mg/m3) from ACGIH (TLV)
	TWA: 50 STEL: 75 CEIL: 125 (ppm) from ACGIH (TLV)
	TWA: 410 STEL: 307 CEIL: 510 (mg/m3) from
OSHA	
	TWA: 100 STEL: 75 (ppm) from OSHA
Light aliphatic solvent naphtha (petroleum)	Not available.

Consult local authorities for acceptable exposure limits.

Section 9. Physical and Chemical Properties

Physical State and Appearance
Liquid - Boiling/Condensation Point
The lowest known value is 64.7 deg C (148.5 deg F) (Methyl alcohol). Weighted average: 79.34 deg C (174.8 deg F)
Melting/Freezing Point
May start to solidify at 0 deg C (32 deg F) based on data for:
Water. Weighted average: -107.43 deg C (-161.4 deg F)
Color - Not available.
Specific Gravity - Weighted average: 0/8 (Water = 1)
Vapor Pressure - The highest known value is 97.68 mm of Hg (at 20 deg C) (Methyl alcohol).
Weighted average: 42.15 mm of Hg (at 20 deg C)
Vapor Density
The highest known value is 3.45 (Air = 1) (Methyl isobutyl ketone). Weighted average: 1.62 (Air = 1)
Volatility
Odor Threshold
The highest known value is 180 ppm (Ethanol) Weighted average: 175.8 ppm
Evaporation Rate
The highest known value is 3.3 (Ethanol) Weighted average: 3.28 compared to Butyl acetate.
VOC
Viscosity -Not available
Solubility
Easily soluble in cold water, hot water, methanol, diethyl ether.
pH (1% Soln/Water)
Neutral.
Odor -Not available.
Taste -Not available.
Physical Chemical Comments -Not available.

Section 10. Stability and Reactivity
Stability and Reactivity
The product is stable.
Conditions of Instability - Not available.
Incompatibility with Various Substances
Reactive with oxidizing agents.
Non-reactive with acids, alkalis.
Hazardous Decomposition Products - Not available.
Hazardous Polymerization - Not available.

Section 11. Toxicological Information
Toxicity to Animals
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 2080 mg/kg (Rat).
(Methyl isobutyl ketone).
Acute dermal toxicity (LD50): 15800 mg/kg (Rabbit.).
(Methyl alcohol).Acute toxicity of the vapor (LC50): 8000 ppm 4 hour(s) (Rat.). (Ethanol).
Chronic Effects on Humans
CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for human or animal.) by ACGIH (Ethanol). Classified A4 (Not classifiable for human or animal.) by ACGIH (Ethyl acetate).
DEVELOPMENTAL TOXICITY: PROVEN (Ethanol)
The substance is toxic to blood, the nervous system, the reproductive system, liver, upper respiratory tract, skin, eyes, respiratory tract, gastrointestinal tract, kidneys.
Other Toxic Effects on Humans
Very hazardous in case of skin contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.
Special Remarks on Toxicity to Animals - Not available.
Special Remarks on Chronic Effects on Humans
0040 Passes through the placental barrier.
May be fatal or cause blindness if swallowed. (Methyl alcohol)
Special Remarks on Other Toxic Effects on Humans
Moderately toxic and narcotic in high concentrations.
Experimentally tumorigen. (Ethanol)

Section 12. Ecological Information
Ecotoxicity - Not available.
BOD5 and COD - Not available.
Biodegradable/OECD - Not available
Mobility - Not available.
Toxicity of the Products of Biodegradation
Possibly hazardous short term degradation products are not likely.
However, long term degradation products may arise.
The products of degradation are less toxic than the product itself.
Special Remarks on the Products of Biodegradation - Not available.

Section 13. Disposal Considerations

Waste Information - Not available.
Waste Stream - Not available.
Consult an expert on disposal of waste and material used in spill cleanup and ensure conformity to all federal, state and local disposal regulations. Regulatory requirements are subject to change and may differ from one location to another; the generator of the waste is responsible for proper waste disposal.

Section 14. Transport Information
DOT Classification
Class 3: Flammable liquid.
Ethanol, Solution UN1170 II

Marine Pollutant - Not available.
Hazardous Substances Reportable Quantity (Kg) - Not available.

Special Provisions for Transport - Not available.

Section 15. Regulatory Information
U.S. Federal Regulations
SARA 302/304 Emergency planning and notification:
No products were found.

CERCLA: Hazardous substances: Methyl alcohol: 5000 lbs. (2268 kg); Ethyl acetate: 5000 lbs. (2268 kg); Methyl isobutyl ketone: 5000 lbs. (2268 kg);

SARA 313 toxic chemical notification and release reporting: Methyl alcohol: 1%; Methyl isobutyl ketone: 1%.

TSCA 5 (e) substance consent order: Ethyl acetate; Methyl isobutyl ketone
TSCA 8 (a) PAIR: Methyl isobutyl ketone
TSCA 8 (a) IUR: Ethyl acetate; Methyl isobutyl ketone
TSCA 8 (b) inventory: Ethanol; Water; Mthyl alcohol; Ethyl acetate; Methyl isobutyl ketone; Light aliphatic solvent naphtha (petroleum)
TSCA 12 (b) one time export: Ethyl acetate; Methyl isobutyl ketone

SARA 311/312 MSDS distribution – chemical inventory – hazard identification: Ethanol: fire, immediate health hazard, delayed health hazard; Methyl alcohol: fire, immediate health hazard, delayed health hazard; Ethyl acetate: fire, immediate health hazard; Methyl isobutyl ketone: fire, reactive, immediate health hazard; Light aliphatic solvent naphtha (petroleum): fire, immediate health hazard

State Regulations
Rhode Island RTK hazardous substances: Ethanol; Methyl alcohol; Ethyl acetate; Methyl isobutyl ketone
Pennsylvania RTK: Ethanol, Methyl alcohol: (environmental hazards); Ethyl acetate: (environmental hazard); Mthyl isobutyl ketone: (environmental hazard)
Florida: Ethanol; Methyl alcohol; Ethyl acetate; Methyl isobutyl ketone

Minnesota: Ethanol; Methyl alcohol; Ethyl acetate; Methyl isobutyl ketone
Massachusetts RTK: Ethanol; Methyl alcohol; Ethyl acetate; Methyl isobutyl ketone
New Jersey: Ethanol; Methyl alcohol; Ethyl acetate; Methyl isobutyl ketone
New Jersey spill list: Ethanol; Methyl alcohol; Ethyl acetate; Methyl isobutyl ketone

California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Ethanol

Section 16. Other Information

National Fire Protection Association (U.S.A.)

Health 1

Flammability 3

Reactivity 0

Specific

Hazard

Other Special Considerations - Not available.

This mixture has not been tested as a whole, the data presented is based on the properties of the individual components.

----------NOTICE----------

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* * * E N D OF M S D S * * *

MSDS

24 Hour Emergency Telephone: 908-859-2151

CHEMTREC: 1-800-424-9300
National Response in Canada
CANUTEC: 613-996-6666
From: Mallinckrodt Baker, Inc.
222 Red School Lane Outside U.S. and Canada
Phillipsburg, NJ 08865 Chemtrec: 202-483-7616

MALLINCKRODT

NOTE CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

FORMALDEHYDE SOLUTION, BUFFERED 10%

1. Product Identification

Synonyms: Formaldehyde solution, buffered, 10% (v/v) in aqueous phosphate buffer

CAS No: Not applicable to mixtures.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: HCHO and CH_3OH in water.
Product Codes: H121

2. Composition/Information on Ingredients

Ingredient	CAS No.	Percent	Hazardous
Methyl Alcohol	67-56-1	1 – 1.5%	Yes
Formaldehyde	50-00-0	4%	Yes
Water	7732-18-5	-95%	No

DANGER! MAY BE FATAL IF SWALLOWED HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT STRONG SENSITIZER MAY CAUSE BLINDNESS, COMBUSTIBLE LIQUID AND VAPOR. SUSPECT CANCER HAZARD CONTAINS FORMALDEHYDE WHICH MAY CAUSE CANCER. Risk of cancer depends upon duration and level of exposure.

3. Hazards Identification

Emergency Overview

Potential Health Effects

The perception of formaldehyde by odor and eye irritation becomes less sensitive with time as one adapts to formaldehyde. This can lead to overexposure if a worker is relying on formaldehyde's warning properties to alert him or her to the potential for exposure.

Inhalation:

May cause sore throat, coughing, and shortness of breath. Causes irritation and sensitization of the respiratory tract. Concentrations of 25 to 30 ppm cause severe respiratory tract injury leading to pulmonary edema and pneumonitis. May be fatal in high concentrations.

Ingestion:

Can cause severe abdominal pain, violent vomiting, headache, and diarrhea. Larger does may produce decreased body temperature, pain in the digestive tract, shallow respiration, weak irregular pulse,

unconsciousness and death. Methanol component affects the optic nerve and may cause blindness.

Skin Contact:

Toxic. May cause irritation to skin with redness, pain, and possibly burns. Skin absorption may occur with symptoms paralleling those from ingestion. Formaldehyde is a severe skin irritant and sensitizer. Contact causes white discoloration, smarting, cracking and scaling.

Eye Contact:

Vapors cause irritation to the eyes with redness, pain, and blurred vision. Higher concentrations or splashes may cause irreversible eye damage.

Chronic Exposure:

Frequent or prolonged exposure to formaldehyde may cause hypersensitivity leading to contact dermatitis. Repeated or prolonged skin contact with formaldehyde may cause an allergic reaction in some people. Vision impairment and enlargement of liver may occur from methanol component. Formaldehyde is a suspected carcinogen (positive animal inhalation studies).

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance. Previously exposed persons may have an allergic reaction to future exposures.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

If swallowed and the victim is conscious, dilute, inactivate, or absorb the ingested formaldehyde by giving milk, activated charcoal, or water. Any organic material will inactivate formaldehyde. Keep affected person warm and at rest. Get medical attention immediately. If vomiting occurs, keep head lower than hips.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Monitor arterial blood gases and methanol levels after significant ingestion. Hemodyalysis may be effective in formaldehyde removal. Use formic acid in urine and formaldehyde in blood or expired air as diagnostic tests.

5. Fire Fighting Measures

Fire:

Flash point: 85° C (185°F) cc

Combustible liquid and vapor! Gas vaporizes from solution and is flammable in air.

Explosion:

Above the flash point, explosive vapor-air mixtures may be formed. Containers may explode when involved in a fire.

Fire Extinguishing Media:

Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

Water spray may be used to keep fire exposed containers cool. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e.g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Store in a tightly closed container. Protect against physical damage. Outside or detached storage is preferred. Inside storage should be in a standards flammable liquids storage room or cabinet. Separate from oxidizing materials. Storage and use areas should be No Smoking areas. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Protect from freezing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):

0.75 ppm (TWA), 2ppm (STEL), 0.5 ppm (TWA) action level for formaldehyde

200 ppm (TWA) for methanol

-ACGIH Threshold Limit Value (TLV):

0.3 ppm Ceiling formaldehyde, A2 Suspected Human Carcinogen

200 ppm (TWA) 250 ppm (STEL) skin for methanol

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control

the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirator (NIOSH Approved)

If the exposure limit is exceeded, a full facepiece respirator with a formaldehyde cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Irritation also provides warning. For Methanol: If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:

See OSHA Standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1048)

9. Physical and Chemical Properties

Appearance: Clear, colorless solution. Boiling Point: ~100°C (~212°F)

Odor: Slight pungent odor. Melting Point: ~0°C (~32°F)

Solubility: Soluble in water. Vapor Density (Air=1):

Specific Gravity: ~1.0 Essentially the same as water.

pH: No information found. Vapor Pressure (mm Hg):

% Volatiles by volume @ 21°C (70°F): Essentially the same as water.

100 Evaporation Rate (BuAc=1): Essentially the same as water.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

May form carbon dioxide, carbon monoxide, and formaldehyde when heated to decomposition.

Hazardous Polymerization: Will not occur

Incompatabilities:

Incompatible with oxidizing agents and alkalis. Reacts explosively with nitrogen dioxide at –180° C (356° F). Reacts violently with perchloric acid, perchloric acid-aniline mixtures, and nitromethane. Reaction with hydrochloric acid may form bis-chloromethyl ether, and OSHA regulated carcinogen.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Formaldehyde: Oral rat LD50: 100 mg/kg; skin rabbit LD50: 270 uL/kg, Irritation data: eye, rabbit, 750ug Severe; inhalation rate LC50: 203 mg/m$^{3;}$ investigated as a tumorigen, mutagen, reproductive effector; Cancer Status: an OSHA regulated carcinogen. Methanol: oral rat LD50: 5628 mg/kg; inhalation rat LC50: 64000 ppm/4H; skin rabbit LD50: 15800 mg/kg; investigated

Cancer Lists

as a tumorigen, mutagen, reproductive effector.

-- NTP Carcinogen—

Ingredient	Known	Anticipated	IARC Category
Methyl Alcohol (67-56-1)	No	No	None
Formaldehyde (50-00-0)	No	Yes	2A
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:

The following statements refer to the environmental fate of formaldehyde. When released into the soil, this material is expected to leach into groundwater. When released into water, this material is expected to readily biodegrade. When released into water, this material is not expected to evaporate significantly. This material is not expected to significantly bioaccumulate.

When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to be readily degraded by photolysis. When released into the air, this material is expected to be readily removed from the atmosphere by dry and wet deposition. When released into the air, this material is expected to have a half-life of less than 1 day. The following statements refer to the environmental fate of methanol. When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into the air, this material is expected to exist in the aerosol phase with a short half-life. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition. When released into air, this material is expected to have a half-life between 10 and 30 days.

Environmental Toxicity:

The following toxicity information is for the formaldehyde portion. this material is expected to be slightly toxic to aquatic life. The LC5096-hour values for fish are between 10 and 100 mg/1. The methanol portion is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/1.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

Chemical Inventory Status

					--Canada--			
Ingredient	TSCA	EC	Japan	Australia	Korea	DSL	NDSL	Phil.
Methyl Alcohol (67-56-1)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Formaldehyde (50-00-0)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes

Federal, State & International Regulations

	--SARA 302--		---------SARA 313-------		-RCRA--TSCA-		
Ingredient	RQ	TPQ	List	Chemical Catg.	CERCLA	261.33	8(d)
Methyl Alcohol (67-56-1)	No	No	Yes	No	5000	U154	No
Formaldehyde (50-00-0)	100	500	Yes	No	100	U122	No
Water (7732-18-5)	No	No	No	No	No	No	No

CHEMICAL WEAPONS CONVENTION: NO TSCA 12(B): NO CDTA: NO

SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No Reactivity: No (Mixture/Liquid)

Warning:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2T Australian Poison Schedule: No information found.

WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 2 Reactivity: 0

Label Hazard Warnings:

DANGER! MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN, CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT, STRONG SENSITIZER, MAY CAUSE BLINDNESS, COMBUSTIBLE LIQUID AND

VAPOR. SUSPECT CANCER HAZARD. CONTAINS FORMALDEHYDE WHICH MAY CAUSE CANCER. Risk of cancer depends upon duration and level of exposure.

Label Precautions: Keep away from heat, sparks and flame. Do not breathe vapor. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Physical and health hazard information is available from employer and from material safety data sheets.

Label First Aid: In all cases call a physician. If swallowed and the victim is conscious, dilute, inactivate, or absorb the ingested formaldehyde by giving milk, activated charcoal, or water. Any organic material will inactivate formaldehyde. Keep affected person warm and at rest. If vomiting occurs, keep head lower than hips. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes.

Product Use: Laboratory Reagent.

Revision Information: MSDS Section(s) changed since last revision of document include: 3, 4, 16.

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Prepared by: Strategic Services Division
Phone Number (314) 539-1600 (U.S.A.)

Appendix E

Formalin Health and Safety

FORMALIN HEALTH AND SAFETY

All field and laboratory activities will be performed in accordance with the Occupational Safety and Health Administrations' requirements for a safe work place. It is the responsibility of the participants to establish and implement the appropriate health and safety procedures for the work being performed. All field staff are expected to review and understand the Material Safety Data Sheet and the Chemical Fact Sheet for chemicals of concern provided by field staff supervisors. Field staff are instructed to immediately report to their supervisor the development of any adverse signs or symptoms that they suspect are attributable to chemical exposure.

The environmental samples scheduled to be collected during this Program will be obtained from surface water bodies located in natural settings. Samples to be collected include fish specimens and aquatic macroinvertebrates. The sample stations and samples to be collected are not considered to be hazardous; however, sample preservation materials include formalin (formaldehyde), which requires prudent safety precautions by those collecting samples and those coming into contact with or disposing of samples collected during this Program.

Hazardous Materials (Formaldehyde)

Commercial grade formalin contains 37 to 55 percent formaldehyde. The use of formaldehyde and its derivatives are regulated under 29 CFR 1910.1048. Formaldehyde is a suspected human carcinogen. Formaldehyde is highly flammable, and is incompatible with strong oxidizers, strong alkalies, acids, phenols, and urea.

Formaldehyde Exposure Limits

There may be no safe level of exposure to a carcinogen, so all contact with formalin should be reduced to the lowest possible level. The odor threshold of 0.83 parts per million (ppm) for formaldehyde serves only as a warning of exposure. The permissible exposure limit (PEL) for formaldehyde is 0.75 ppm averaged over an eight-hour work shift. The time-weighted average (TWA) for airborne concentrations of formaldehyde (STEL) is 2 ppm. The American Conference of Governmental Industrial Hygienist recommend airborne exposure limit to formaldehyde is not to exceed 0.3 ppm averaged over an eight-hour work period.

Respirators shall be used when 1) installing feasible engineering and work practice controls, 2) engineering and work practice controls are not feasible, and 3) engineering and work practice controls are not sufficient to reduce exposure to or below the Permissible Exposure Limit. Respirator use should be limited to an MSHA/NIOSH approved supplied air respirator with a full face piece operated in the positive mode or with a full face piece, hood, or helmet operated in the continuous flow mode. A MSHA/NIOSH approved self-contained breathing apparatus with a full-face piece operated in pressure demand or other positive mode is also recommended.

Formaldehyde exposure occurs through inhalation and absorption. Exposure irritates the eyes, nose, and throat, and can cause skin and lung allergies. Higher levels can cause throat spasms and a build-up of fluid in the lungs, cause for a medical emergency. Contact can cause severe eye and skin burns, leading to permanent damage. These may appear hours after exposure, even if no pain is felt.

Formaldehyde First Aid

If formaldehyde gets into the eyes, remove any contact lenses at once and irrigate immediately with deionized water, distilled water or saline solution. If formaldehyde contacts exposed skin, flush with water promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once and perform artificial respiration, if needed. When formaldehyde has been swallowed, get medical attention. Give large quantities of water and induce vomiting. Do not make an unconscious person vomit.

Formaldehyde Fire and Explosion Hazard

Mixtures of air and free formaldehyde gas are highly flammable. Formalin is a combustible liquid, and presents a moderate fire and explosion hazard. Use a dry chemical, carbon dioxide, water spray, or "alcohol" form to extinguish formalin fires. Store formalin solutions in insulated, closed containers in a cool, dry, well-ventilated area separate from oxidizing agents and alkaline materials. Protect formalin containers from physical damage.

Formalin Spill Procedures

In case of a spill or leak, eliminate all sources of ignition, provide adequate ventilation, notify supervisor, and evacuate all nonessential personnel. Neutralize spilled formalin with aqueous ammonia or mix with sodium sulfite. Wash residues with diluted ammonia to eliminate vapor. Prevent runoff from entering streams, surface waters, waterways, watersheds, and sewers.

Formalin Work Area Controls

Work area locations at stream sampling stations will be selected to ensure adequate ventilation when sample container lids are removed. Work area locations will be located downwind from field crew activities, and will be isolated from field crew traffic. A single field crew member will be designated and authorized to secure the formaldehyde work area at sampling stations. This crew member will ensure proper handling of sample containers and fish specimens, and will be responsible for establishing proper precautions for minimizing field crew exposure to formaldehyde at sampling stations.

Formalin Work Area Practices

Formalin (formaldehyde) is being used in this protocol for the purpose of asphyxiation and preservation of fish specimens. Pre-labeled and pre-preserved plastic sample containers will be delivered to the field crew secured in large ice chests. Field crews will transport the containers in the coolers to the field sample stations. Fish specimens will be collected by hand and placed into the sample containers. Container lids will be removed immediately prior to, and closed immediately after fish specimens and specimen labels are placed into the sample container. Specimens will be placed into the sample container and minimize the amount of time the sample preservative is not contained. The sample container will be placed into a large plastic bag and secured in an ice cooler until delivered to the laboratory for analysis.

Formalin Personal Protection

Field crew members within the designated formalin work area at sample stations will wear a full face shield, impervious nitrile, butyl rubber, or viton gloves, boots and aprons, etc. to prevent excessive or prolonged skin contact. Contact lenses will not be worn within the designated formalin work area. No eating, drinking, or smoking will be allowed in the designated formalin work area.

Wash thoroughly after using formalin. Avoid transferring formalin from hands to mouth while eating, drinking, or smoking. Avoid direct contact with formalin. Remove contaminated clothing and launder before wearing. Contaminated work clothing should not be taken home. Contaminated work clothing should be laundered by individuals who have been informed of the hazards of exposure to formalin.

Appendix F

DEQ Flip Charts for

Riffle/Run Habitat Assessments

March 2003
H. S.

Habitat Assessment Data Sheet
RIFFLE/RUN PREVALENCE

Riffle & Run Habitats: areas of the stream with *faster* current and *shallower* depth; typically much of the water surface is visibly broken. Look for in Rosgen A-type channels, and streams with coarser substrate. Can have numerous pools.

2. *Instream Cover (fish):*

Greater than 50% mix of cobble, gravel, woody debris, undercut banks, or other stable fish cover.	30-50% mix of cobble, gravel, or other stable fish cover. Adequate cover.	10-30% mix of cobble, gravel, other stable fish cover. Cover availability is less than desirable.	Less than 10% cobble, gravel or other stable cover. Lack of cover is obvious.
16 – 20	11 – 15	6 – 10	0 – 5

3. *Embeddedness (riffles):*

Gravel, cobble and boulder particles are 0-25% surrounded by fine sediment (particles less than 6.35mm)	Gravel, cobble and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble and boulder particles are >75% surrounded by fine sediment, or bottom is sand, clay or bedrock.
16 – 20	11 – 15	6 – 10	0 – 5

5. *Channel Shape (see overleaf for further guidance):*

Trapezoidal	Rectangular	Inverse Trapezoidal
11 – 15	6 – 10	0 – 5

10. *Disruptive Pressures (on streambank, immediately adjacent to stream):*

Vegetative disruption minimal or not evident. Almost all potential plant biomass at present stage of development remains.	Disruption evident but not affecting community vigor. Vegetative use is moderate, 60-90% of the potential plant biomass remains.	Disruption obvious; some patches of bare soil or closely cropped vegetation present. 30-60% of potential plant biomass remains.	Disruption of streambank vegetation is very high. Vegetation has been removed to less than 30% of the potential plant biomass.
9 – 10	6 – 8	3 – 5	0 – 2

11. *Zone of Influence (width of riparian vegetative zone):*

Width of riparian vegetative zone (on each side) is at least 4 times the width of the stream. Human activities have caused no impact at all.	Width of riparian vegetative zone (on each side) is at least twice the width of the stream. Human activities have caused minimal impact.	Width of riparian vegetative zone (each side) is at least as wide as the stream. Human activities have caused a great deal of impact.	Little or no riparian vegetation due to man induced activities (parking lots, clearcuts, lawns or crops planted to the edge of the stream).
9 – 10	6 – 8	3 – 5	0 – 2

Appendix G

DEQ Flip Chart for

Glide/Pool Habitat Assessments

Habitat Assessment Data Sheet
GLIDE/POOL PREVALENCE

Glide & Pool Habitats: **usually few riffles and slower water column velocity. Generally, but not always, deeper than riffle/run habitats. Look for in lower gradient stream segments; often seen in wide, flat valleys. Usually *depositional* in character. Number of pools can vary.**

1. *Pool Substrate Characteristic:*			
Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or submerged vegetation.
16 – 20	11 – 15	6 – 10	0 – 5

2. *Instream Cover (fish):*

See overleaf

3. *Pool Variability:*			
Even mix of deep, shallow, large and small pools.	Majority of pools large and deep. Very few shallow pools.	Shallow pools much more prevalent than deep pools.	Majority of pools small and shallow, or pools absent.
16 – 20	11 – 15	6 – 10	0 – 5

5. *Channel Shape:*

See overleaf

10. *Disruptive Pressures (on streambank, immediately adjacent to stream):*

See overleaf

11. *Zone of Influence (width of riparian vegetative zone, least buffered side):*

See overleaf

Channel Shape Guidance
(crew to make final determination, based on field observations)

Mean Bank Angle	**Predominant Wetted Channel Shape**	Score	Mean Bank Angle	**Predominant Wetted Channel Shape**	Score
0-10	Inverse Trapezoidal	1	81-90	Rectangular	9
11-20	Inverse Trapezoidal	2	91-100	Rectangular	10
21-30	Inverse Trapezoidal	3	101-110	Trapezoidal	11
31-40	Inverse Trapezoidal	4	111-120	Trapezoidal	12
41-50	Inverse Trapezoidal	5	121-130	Trapezoidal	13
51-60	Rectangular	6	131-140	Trapezoidal	14
61-70	Rectangular	7	> 140	Trapezoidal	15
71-80	Rectangular	8			

Appendix H

Electrofishing Safety Orientation and Acknowledgement

Electrofishing Safety Policy and Plan

1. **Purpose**
   The purpose is to ensure human safety during electrofishing operations by establishing Department of Environmental Quality competency requirements for electrofishing operations. This plan also provides guidelines for a standard operating procedure and the safe operation of electrofishing equipment.

2. **Scope**
   The provisions of this plan apply to all IDEQ activities using electricity (produced by gasoline powered generator/alternators or batteries) to sample animals in aquatic habitats.

3. **Policy**
   IDEQ recognizes the electrofishing operation as a hazardous activity for which skills and training is required. It is, therefore, IDEQ policy that all personnel serving as BURP (Beneficial Use Reconnaissance Program) coordinators demonstrate knowledge of the principles and techniques of electrofishing. BURP coordinators will be considered knowledgeable of the principles and techniques of electrofishing upon satisfactory completion of the US Fish and Wildlife Service, Principles and Techniques of Electrofishing course or equivalent training.

4. **Responsibilities**
   A. The IDEQ Health and Safety Coordinator is responsible for maintaining a current listing of all IDEQ personnel who have attended electrofishing training.

   B. The IDEQ Regional Administrators are responsible for ensuring compliance with the provisions of this plan.

   C. BURP Coordinators are responsible for:
      1) Providing electrofishing crews with the proper equipment, and ensuring that such equipment is fully functional at the beginning of the field season.
      2) Ensuring that the electrofishing crews have and utilize the proper safety equipment.
      3) Ensuring that all crew members are first aid and CPR certified.
      4) Ensuring the availability of a well-equipped, water-tight first aid kit.
      5) Discussing potential hazardous conditions encountered during electrofishing operations with crew members
      6) Ensuring that all crew members are trained in proper electrofishing techniques.
      7) Designating an electrofishing team leader.

   D. Electrofishing Team Leader. Only individuals demonstrating knowledge of electrofishing techniques can serve as electrofishing team leaders. As the individuals in charge of electrofishing operations, the team leaders are responsible for the following:
      1) Identifying hazardous field conditions associated with proposed electrofishing operations, determining measures to protect electrofishing team members, and appropriately briefing team members.

2) Ensuring precautions are taken in the field to avoid harm to the public, domestic animals, or wildlife
3) Ensuring that all electrofishing operations cease, and all crew members go ashore in the event of inclement weather.
4) Ensuring that electrofishing operations include only those persons necessary to conduct a safe and efficient operation and those members being trained.
5) Reviewing the electrofishing considerations checklist and ensuring the addition of specialized items to the checklist that pertain to their Regions or operation.
6) Inspecting electrofishing equipment during the field season to assure that it is properly functioning. If repairs are needed, this must be brought to the attention of the Regional BURP coordinator.

E. All crew members must know who their leader is and recognize his/her authority as final in operational decisions. Every crew member has the right to ask questions about any aspect of an electrofishing operation. A crew member has the right to decline participation in the operation if he/she feels unsafe working in the field conditions present. Crew members are responsible for reporting all potential work hazards, accidents, incidents, and job-related illnesses/injuries to their regional BURP coordinator.

5. Training and Education
   A. It is recommended that BURP Coordinators attend the US Fish and Wildlife Service, Principles and Techniques of Electrofishing course so that they have knowledge of the following:

      1) The basic principles of electricity and transmission of current in water.
      2) The basic concept and design guidelines for electrofishing equipment.
      3) Electrofishing equipment, the equipment's capabilities, limitations, and safety features.
      4) The safety precautions to employ, while using electrofishing equipment.

   B. All members of the electrofishing crew must have a current certification in cardiopulmonary resuscitation (CPR) and first aid. All crew members will be briefed in the following areas:

      1) Hazards involved in electrofishing.
      2) Safe operation of electrofishing equipment.
      3) Basic emergency procedures for drowning, unconsciousness, and electrical shock.
      4) Communication between electrofishing crew members while operating equipment.
6. Standard Safety Equipment
   A. All persons using portable electrofishers will wear protective gear which will insulate the wearer from electrical shock, preferably chest waders, but rubber hip boots would suffice. All footwear will be equipped with non-slip soles.

   B. Appropriate gloves will be worn and will be inspected for punctures before each use. They will be replaced if damaged.

   C. Polarized sunglasses will be worn when there is glare on the water.

7. Standard Operating Procedure
   All persons must be aware of the hazards involved in using portable electrofishers in running waters, such as slippery surfaces, swift water currents, deep areas; and obstacles, such as logs or similar objects.

   A. A minimum of three people should be present to conduct electrofishing operations.

   B. At all times during the electrofishing operation, the crew must communicate as to whether or not the unit is putting power into the water. If a crew member must reach into the water with their hands, it is their responsibility to inform the person operating the equipment, so they can stop the operation. Communication between crew members is essential to a safe operation.

   C. Netters will work beside or behind the individual with the electrofishing equipment to ensure the electrical field is well in front of both workers.

   D. Crew members should only perform one job at a time. A person should not be carrying the bucket of fish and netting at the same time.

   E. While walking in the stream, make sure that one foot is securely planted before stepping with the other foot. Do not cross one leg over the other, especially while walking in swift water.

   F. The individual operating the electrofishing unit should not turn the power on until all crew members are in position and have stable footing.

   G. Crew members will cease electrofishing operations during inclement weather; use discretion during rain.

   H. All safety equipment will be utilized.

   I. All operating manuals for electrofishing equipment must be available to the crew while in the field.

8. Portable Electrofisher Equipment Specifications and Operation
   Only professionally-produced electrofishing equipment should be used, and the equipment should not be altered in any way.

   A. Electrodes

      1) Electrode handles will be constructed of a nonconductive material, and be long enough to avoid hand contact with the water.

      2) The positive electrode (anode) used with portable electrofishers will be equipped with a pressure switch that interrupts the electric current upon release.

B. Portable Electrical Power Source

1) Batteries used as an electrical power source for backpack shockers will be of the gel type that will not leak when tipped or overturned.

2) Backpacks will be equipped with a quick-release belt (hip) and shoulder straps.

C. Power Control

1) The operator will have a switch to the pulsator or power control unit in order for the electricity to be turned off quickly in an emergency.

2) All equipment purchased after October 1, 1985 must be equipped with a tilt switch that breaks the circuit if the operator falls.

Idaho Beneficial Use Reconnaissance Program

Acknowledgement of Electrofishing Training

I have received instruction and orientation about electrofishing from the Idaho Department of Environmental Quality. As a result, I understand and accept the following principles:

1. Electrofishing (EF) is an inherently hazardous activity in which safety is the primary concern. The electrical energy used in EF is sufficient to cause electrocution. During operations, it is critical to avoid contact with the electrodes and surrounding water. The EF field is most intense near the electrodes, but can extend outward 10-20 feet.
2. A communication system must be known by all members of an EF crew. A minimum of three people are recommended for all EF operations. Crew members should only perform one job at a time (e.g. a person should not be carrying the bucket of fish and netting at the same time).
3. The individual operating the electrofishing unit should not turn the power on until all crew members are in position, have stable footing, and all members agree to begin.
4. An EF operation should proceed slowly and carefully; avoid fish-chasing and other sudden maneuvers. Operations should cease during inclement weather; use discretion during rain.
5. The main power switch must be turned off immediately, if an emergency occurs.
6. Rubber knee boots are minimal foot protection, as are rubber gloves for the hands. Chest-waders with felt soles are recommended. Ear protection is recommended for those working near the generator. Crews will be provided with the necessary safety equipment that is in proper working condition.
7. All members of the EF crew must be certified for CPR and first aid. A first aid kit must be accessible during an EF operation.
8. Stunned fish should be removed from the EF field as soon as possible, and not subjected to continuous power by being held in the field. Using the anode as a dip net should be avoided; it is a poor electrofishing technique, and potentially injurious to fish.
9. Measures should be taken to avoid harm to the public, domestic animals, and wildlife. The public cannot participate in electrofishing operations.
10. All EF crew members must know who their leader is and recognize his/her authority as final in operational decisions. However, every crew member has the right to ask questions about any aspect of an EF operation. A crew member has the right to decline participation in an EF operation, without fear of employer recrimination, if he/she feels unsafe in doing such work.

_____ / _____ .

Signature of Employee Date

Appendix I

DEQ Fish Taxon Codes

FTAXACODE	AFSCNAME	AFSSNAME
1	Pacific lamprey	*Lampetra tridentata*
2	white sturgeon	*Acipenser transmontanus*
3	American shad	*Alosa sapidissima*
4	lake whitefish	*Coregonus clupeaformis*
5	chum salmon	*Oncorhynchus keta*
6	coho salmon	*Oncorhynchus kisutch*
7	sockeye salmon	*Oncorhynchus nerka*
8	kokanee	*Oncorhynchus nerka*
9	chinook salmon	*Oncorhynchus tshawytscha*
10	rainbow trout	*Oncorhynchus mykiss*
11	cutthroat trout	*Oncorhynchus clarki*
12	Bear Lake whitefish	*Prosopium abyssicola*
13	pygmy whitefish	*Prosopium coulteri*
14	Bonneville cisco	*Prosopium gemmiferum*
15	Bonneville whitefish	*Prosopium spilonotus*
16	mountain whitefish	*Prosopium williamsoni*
17	golden trout	*Oncorhynchus aguabonita*
18	Atlantic salmon	*Salmo salar*
19	brown trout	*Salmo trutta*
20	Arctic char	*Salvelinus alpinus*
21	brook trout	*Salvelinus fontinalis*
22	bull trout	*Salvelinus confluentus*
23	lake trout	*Salvelinus namaycush*
24	Arctic grayling	*Thymallus arcticus*
25	rainbow smelt	*Osmerus mordax*
26	northern pike	*Esox lucius*
27	chiselmouth	*Acrocheilus alutaceus*
28	goldfish	*Carassius auratus*
29	lake chub	*Couesius plumbeus*
30	common carp	*Cyprinus carpio*

31	Utah chub	*Gila atraria*
32	tui chub	*Gila bicolor*
33	leatherside chub	*Gila copei*
34	peamouth	*Mylocheilus caurinus*
35	fathead minnow	*Pimephales promelas*
36	northern pikeminnow	*Ptychocheilus oregonensis*
37	longnose dace	*Rhinichthys cataractae*
38	leopard dace	*Rhinichthys falcatus*
39	speckled dace	*Rhinichthys osculus*
40	redside shiner	*Richardsonius balteatus*
41	tench	*Tinca tinca*
42	Utah sucker	*Catostomus ardens*
43	longnose sucker	*Catostomus catostomus*
44	bridgelip sucker	*Catostomus columbianus*
45	bluehead sucker	*Catostomus discobolus*
46	largescale sucker	*Catostomus macrocheilus*
47	mountain sucker	*Catostomus platyrhychus*
48	black bullhead	*Ameiurus melas*
49	brown bullhead	*Ameiurus nebulosus*
50	channel catfish	*Ictalurus punctatus*
51	tadpole madtom	*Noturus gyrinus*
52	flathead catfish	*Pylodictis olivaris*
53	sand roller	*Percopsis transmontana*
54	burbot	*Lota lota*
55	western mosquitofish	*Gambusia affinis*
56	guppy	*Poecilia reticulata*
57	green sunfish	*Lepomis cyanellus*
58	pumpkinseed	*Lepomis gibbosus*
59	warmouth	*Lepomis gulosus*
60	bluegill	*Lepomis macrochirus*
61	smallmouth bass	*Micropterus dolomieu*

62	largemouth bass	*Micropterus salmoides*
63	white crappie	*Pomoxis annularis*
64	black crappie	*Pomoxis nigromaculatus*
65	yellow perch	*Perca flavescens*
66	walleye	*Stizostedion vitreum*
67	mottled sculpin	*Cottus bairdi*
68	Paiute sculpin	*Cottus beldingi*
69	slimy sculpin	*Cottus cognatus*
70	shorthead sculpin	*Cottus confusus*
71	Bear lake sculpin	*Cottus extensus*
72	Shoshone sculpin	*Cottus greenei*
73	Wood river sculpin	*Cottus leiopomus*
74	torrent sculpin	*Cottus rhotheus*
75	lamprey	*Lampetra sp.*
76	sturgeon	*Acipenseridae sp.*
77	whitefish	*Coregonus sp.*
78	Pacific salmon/trout	*Oncorhynchus sp.*
79	whitefish	*Prosopium sp.*
80	Atlantic salmon/trout	*Salmo sp.*
81	char	*Salvelinus sp.*
82	grayling	*Thymallus sp.*
83	pike	*Esox sp.*
84	chub (Couesius sp.)	*Couesius sp.*
85	chub (Gila sp.)	*Gila sp.*
86	pikeminnow	*Ptychocheilus sp.*
87	dace	*Rhinichthys sp.*
88	shiner	*Richardsonius sp.*
89	sucker	*Catostomus sp.*
90	catfish	*Ictalurus sp.*
91	trout-perch	*Percopsis sp.*
92	sunfish	*Lepomis sp.*

93	bass	*Micropterus sp.*
94	crappie	*Pomoxis sp.*
95	perch	*Perca sp.*
96	sculpin	*Cottus sp.*
97	herring	*Clupeidae*
98	trout	*Salmonidae*
99	minnow	*Cyprinidae*
100	catfish	*Ictaluridae*
101	guppy	*Poeciliidae*
102	sunfish	*Centrarchidae*
103	perch	*Percidae*
104	bullhead	*Ameiurus sp.*
105	cod	*Lota sp.*
106	smelt	*Osmerus sp.*
107	oriental weatherfish	*Misgurnus anguillicaudatus*
108	weatherfish	*Misgurnus sp.*
109	loach (cobitidae)	*Cobitidae*
110	convict cichlid	*Cichlasoma nigrofasciatum*
111	blue tilapia	*Tilapia aurea*
112	Mozambique tilapia	*Tilapia mossambica*
113	redbelly tilapia	*Tilapia zillia*
114	shortfin molly	*Poecilia mexicana*
115	green swordtail	*Xiphophorus helleri*
116	yellow bullhead	*Ameiurus natalis*
117	steelhead	*Oncorhynchus mykiss*
118	grass carp	*Ctenopharyngodon idella*
119	spottail shiner	*Notropis hudsonius*
120	blue catfish	*Ictalurus furcatus*
121	platy	*Xiphophorus sp.*
122	sauger	*Stizostedion canadense*
123	Umpqua dace	*Rhinichthys evermanni*

124	umatilla dace	*Rhinichthys umatilla*
125	tilapia	*cichlidae*
156	killifish	*Cyprinodontidae*
157	banded killifish	*Fundulus diaphanus*
501	cutthroat trout (all stocks) x rainbow trout	*Oncorhynchus clarki X O. mykiss*
502	brook trout x bull trout	*Salvelinus fontinalis X S. confluentus*
503	brook trout x lake trout (splake)	*Salvelinus fontinalis X S. namaycush*
504	brook trout x brown trout (tiger trout)	*Salvelinus fontinalis X Salmo trutta*
505	tiger muskellunge	*Esox lucius E. masquinongy*
9999	fish	*Unidentified*

Appendix J

Electrofishing Checklist

Electrofishing Checklist

Backpack Electrofisher Daily Safety Inspection

Date:_____ Stream: _____

Electrofishing Leader: _____ Crew ID:_____

Crew Members:_____

Manual present? Yes _____ No _____

GENERATOR/ALTERNATOR (if applicable)

_____ 1. Electrical connections secure and protected

_____ 2. Mountings secure

_____ 3. Exhaust directed away from operator

_____ 4. Oil topped up

_____ 5. Gas topped up

_____ 6. Engine clean - no oil or gas leaks

ELECTROFISHER

_____ 1. Controls and gauges operational

_____ 2. Adequate protection of wiring

_____ 3. Adequate connectors and interlocking

_____ 4. Audible tone generator working

_____ 5. "Kill switch" working

_____ 6. Mercury tilt switch working

_____ 7. Anode switch working

_____ 8. Wiring to anode in good condition

_____ 9. Anode in good condition, fastened securely

_____ 10. No screens or nets attached to anode

_____ 11. Cathode in good condition

_____ 12. Cathode clean, fastened securely

_____ 13. Backpack frame in good condition

_____ 14. Quick release buckle of backpack working

PERSONNEL/CREW MEMBERS

_____ 1. Each crew member briefed on unit operation

_____ 2. It is recommended three or more crew members be present, all CPR certified

_____ 3. Each crew member wearing rubber gloves

_____ 4. Each crew member wearing waders or rubber boots

_____ 5. Safety precautions covered

_____ 6. Local arrangements covered (landowner, Fish & Game)

BATTERY (if applicable)

_____ 1. Fully charged, gel type cell

_____ 2. Terminals clean and tight

ANCILLARY EQUIPMENT

_____ 1. Non-conductive dip net handle

_____ 2. First aid kit present

_____ 3. Regulation gas containers

_____ 4. Fish holding containers

_____ 5. Fish measuring board

_____ 6. Jars with formalin

_____ 7. Fish labels

_____ 8. Fish field forms

_____ 9. Formalin safety equipment